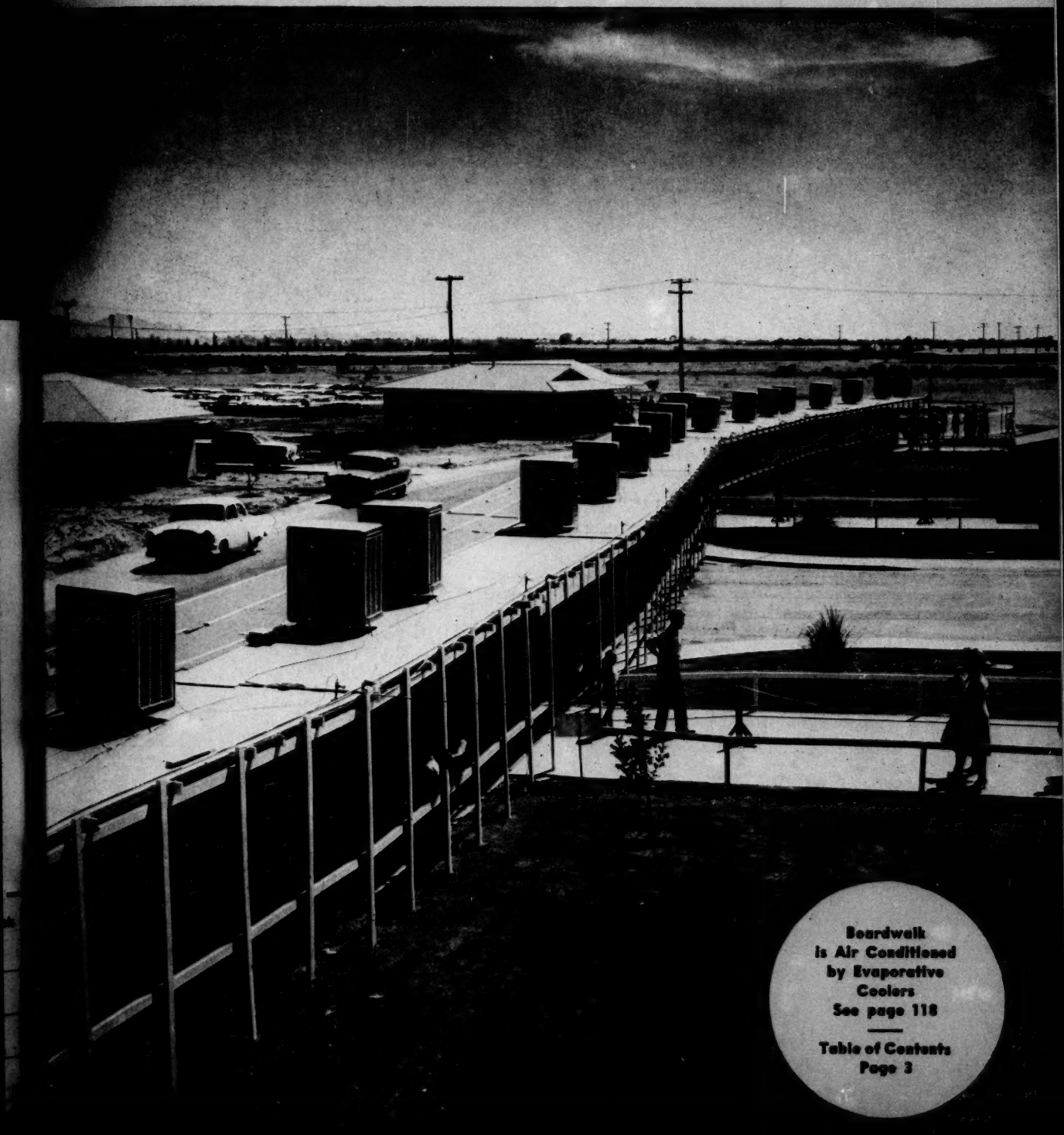
AIR CONDITIONING HEATING AND VENTILATING

ECEMBER, 1958—55th Year



Boardwalk is Air Conditioned by Evaporative Coolers
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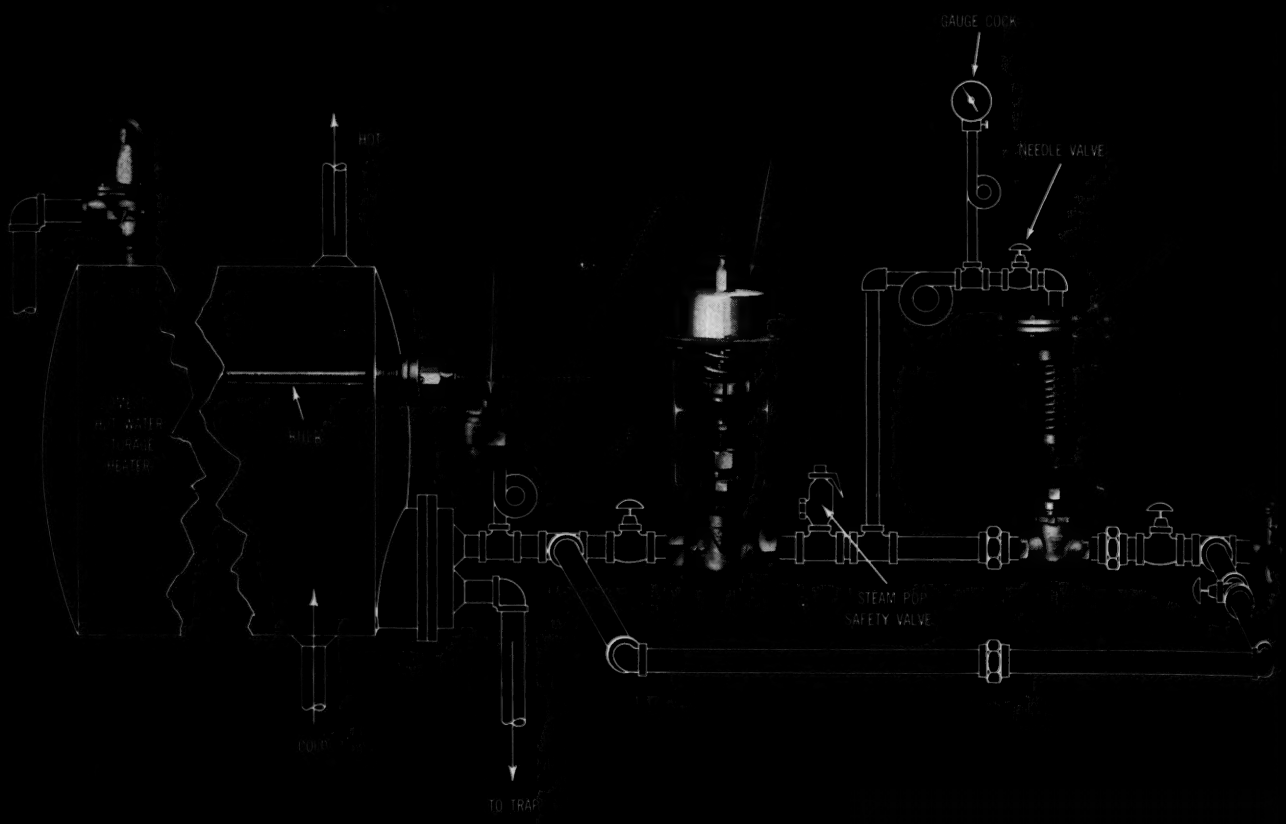

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Not only is it *easier* to write WATTS into the specs, but you can be *sure* of years of efficient, trouble-free operation and service satisfaction.

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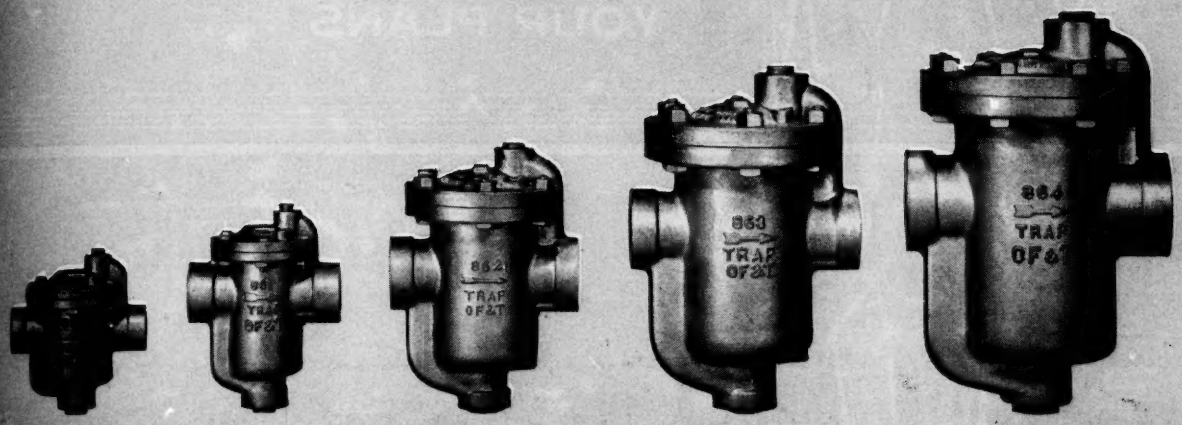
Be sure . . . Use **WATTS** Protection and Control Specialti

ANNOUNCING a Complete New Line . . .

ARMSTRONG Open Float and Thermostatic Steam Traps



860 (¾") 861 (1") 862 (1¼") 863 (1½") 864 (2")

Designed and Made by Armstrong Especially for Low Pressure Heating Service

■ Armstrong Open Float and Thermostatic Traps are the result of the demand by user-owners and contractors for an effective, trouble-free steam trap for heating service.

How They Work

When the steam is first turned on, Armstrong O.F.&T. traps quickly vent the air that has accumulated in the heating units. After start-up, the traps will vent air and CO_2 gas at steam temperature to prevent corrosion of unit heater tubes and other types of finned radiation. Condensate is removed as fast as it accumulates without loss of steam.

Advantages of Armstrong O. F. & T. Traps

The design and construction of Armstrong Open Float and Thermostatic Steam Traps provides outstanding benefits to both the owner and the installing contractor:

LOW COST is made possible by simple, compact design and large volume production.

EASY INSTALLATION. Pipe connections are horizontal and opposite. Traps are supported by the connecting pipes.

INTERNAL CHECK VALVES of 18-8 stainless steel can be furnished with the traps to save cost of installing external check valves.

YEARS OF SERVICE LIFE . . . Working parts are all stainless steel, highly resistant to both corrosion and wear.

MINIMUM MAINTENANCE . . . comes not only from the use of stainless steel parts, but also because the trap is self-scrubbing. Ordinary sediment and sludge are washed right through with the condensate.

Further Information Available

If a trap with these features is of interest to you, get in touch with your nearby Armstrong Representative. Ask him for Bulletin 775 which gives price, dimension and capacity data, or use the coupon below.

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8463 Maple Street • Three Rivers, Michigan

FREE BULLETIN
No. 775 gives detailed information on Armstrong O.F.&T. traps.

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8463 Maple Street, Three Rivers, Michigan
Please send a copy of Bulletin No. 775.

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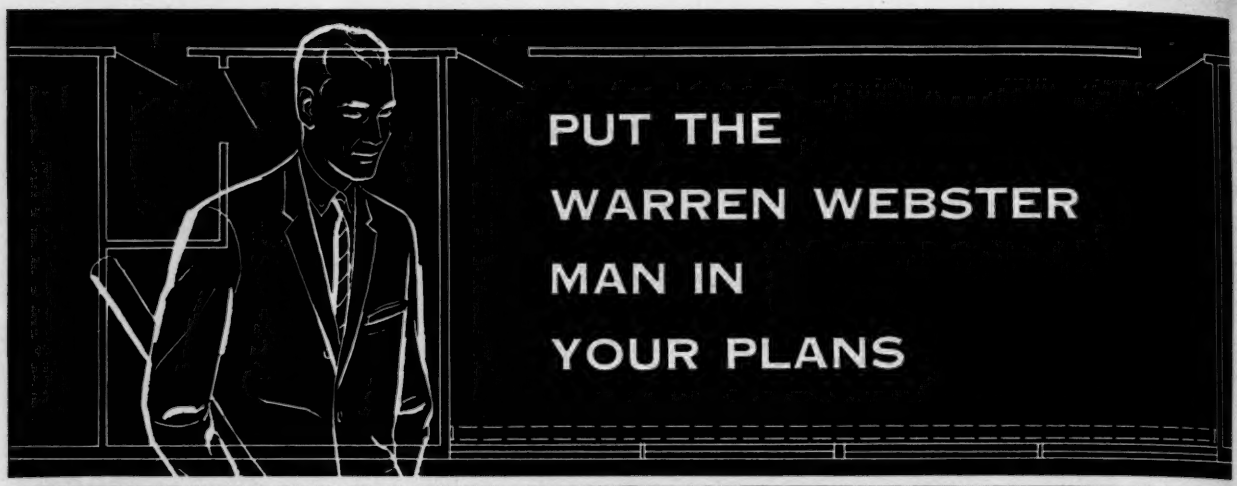

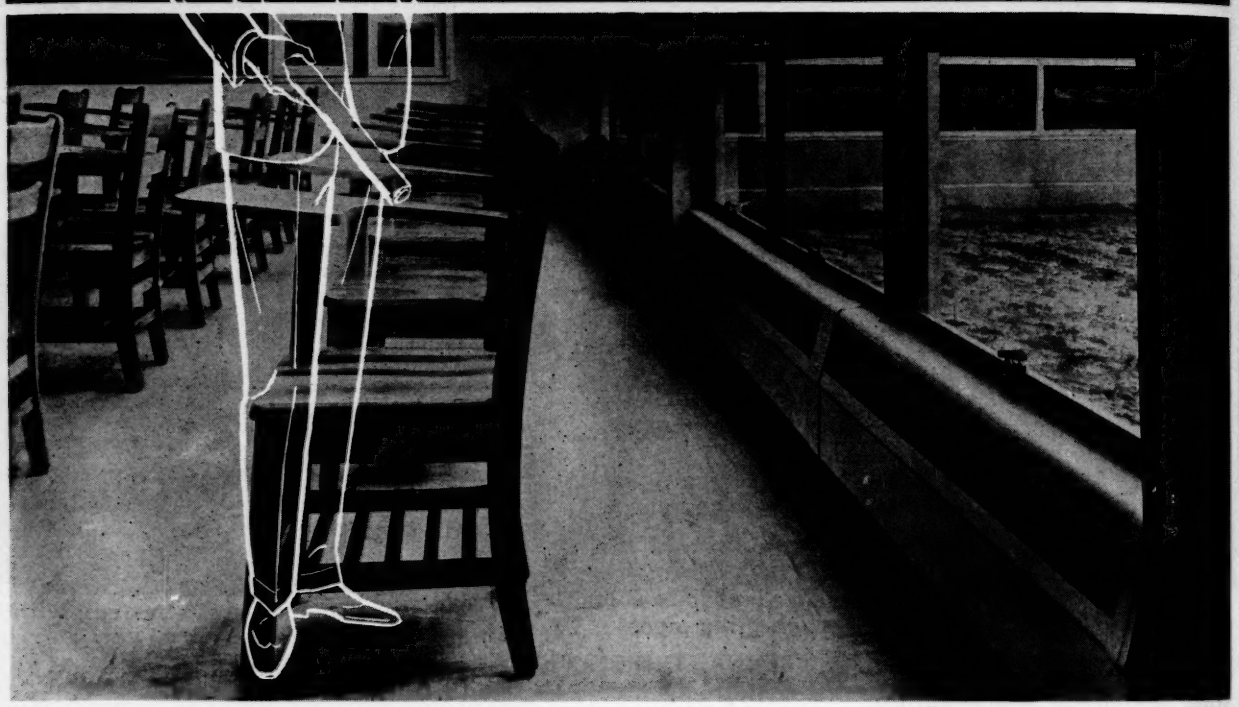

Walvector Stretches Out Your Heating Dollar

Where low operating costs and high comfort heating are major considerations, Webster Walvector meets every specification. Fuel dollars go farther, because Webster Walvector eliminates hot-and-cold spots, ends drafts, spreads uniform clean heat without waste.

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Yes, your heating dollar goes farther, more comfortably, when your Warren Webster Man puts Webster Walvector in your plans. Ask him for the exciting details. Or write for Bulletin B-1551. Warren Webster & Company, Camden 5, New Jersey. Since 1888. Offices in principal U.S. cities and Canada.

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FINEST
PRODUCT

the Warren Webster Man

WARREN WEBSTER
HEATING . . . COOLING

AIR CONDITIONING HEATING AND VENTILATING

Volume 55, Number 12 December, 1958

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[redacted]

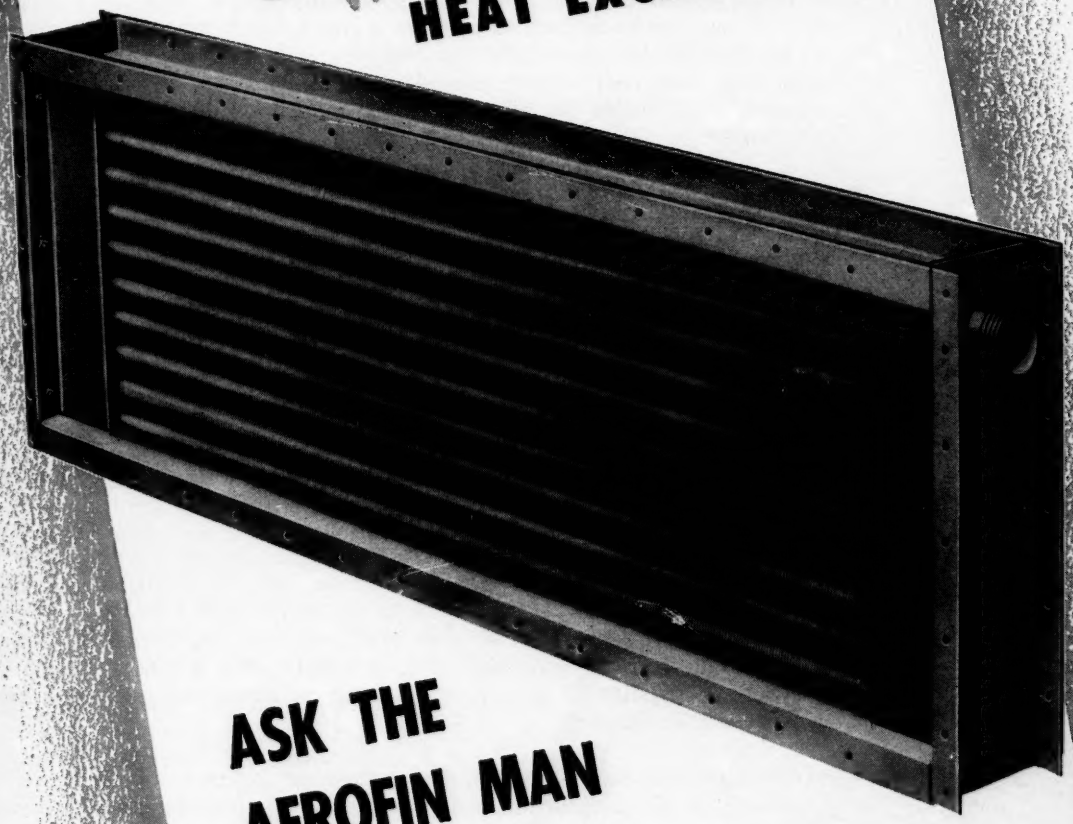
Air conditioned schools and colleges are less expensive to build, Charles V. Fenn, Carrier vice-president says. Systems providing complete control of inside atmosphere year-round, he states, can be installed for the same or less than conventional equipment, in a school designed to take advantage of construction economies afforded by air conditioning. For example, single level or multi-story block-type buildings eliminate long, expensive wings for cross ventilation; ceiling heights may be lowered; and greater use may be made of solid walls separated by floor-to-ceiling glass, 4-6 ft wide, at intervals of about one per classroom.

Schools are being built more economically today than ten years ago, according to Howard H. Juster, project architect of Perkins & Will, an architectural firm that has designed many schools in the East. Demands on the part of some taxpayers for economies often result in its opposite. In one community, Mr. Juster told the New York Times, his firm complied with the school board's demand that $6,000 be cut off the initial price of the structure through the use in the ceiling of an inexpensive substitute for gypsum. The board also ordered a cut of $15 a classroom door through the use of hollow-core instead of solid doors. The cheap ceiling soon warped and became unsightly and the veneer of the hollow doors took a beating from the students.

Massachusetts passed a law that mandates registration by December 26, 1958 of professional engineers and land surveyors doing business in the Commonwealth. Until the Act was signed by Governor Furcolo, Massachusetts was the only state, including Alaska, permitting registration to be optional instead of mandatory. Persons licensed under the previous permissive act by the Board of Registration will continue without any action on their part to be licensed under the new act. The Board of Registration will require the same qualifications for registration of engineers and land surveyors as before. Experience and education must be proven, either by a college degree or through a written examination, and the Board must satisfy itself as to the individual's ability to perform satisfactorily the practice of professional engineering or land surveying. **Out-of-state engineers** may practice in Massachusetts only if they are registered in the state; otherwise, their professional activities in the state are limited to an aggregate of thirty days in one year, and then only if they are registered in a state having equal or higher requirements than Massachusetts. Specific reference is made in the Act to **persons who work for consulting firms,** corporations or companies engaged in professional engineering. In such cases, individual registration is not required, provided that the work does not include approval of final designs and that the work is done under the direct supervision of a person holding a certificate of registration. Provisions covering a one year period are included under what is referred to as the **"grandfather" clause** for persons now earning their livelihood in the practice of engineering or land surveying. It being unconstitutional to deprive one of his property without due process of the law, the Legislature required the inclusion of this provision, one that is common in all states having similar legislation.

Manufacture of air pollution control equipment is one of America's fastest growing industries, says Arnold Arch, president of Air Pollution Control Association and control director of Niagara Falls. He stated that the half-billion dollar annual sales of air cleaning devices exceeds the budgets of all but eleven states. (He was speaking to the members of the Rotary Club of Pittsburgh, Pa., formerly the "Smokey City", and today one of the new industry's best customers.)

*FIRST LINE Extended-Surface HEAT EXCHANGERS



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WASHINGTON OVERTONES

by LORING F. OVERMAN

● Post-election overtones are keeping Washington sounding boards humming with ever-changing speculation.

There are rumors of higher taxes, increased spending, expanded Federal aid in many fields; easier credit, tighter credit; bigger budgets, bigger central government.

How to coax harmony from so complex a political instrumentation as the new 86th Congress will challenge the Administration.

Meanwhile, with such possible exceptions as high taxes and some concessions to unionism, the outlook for air-conditioning and heating-refrigeration people is not unfavorable.

● Observers expect an early drive in Congress for authority and funds to keep the housing program going.

FHA's Norman P. Mason has indicated that the Administration request for authority to insure home mortgages will be "considerably in excess" of amounts sought in the past. FHA received authority last May to insure $4-billion in home mortgages. Commissioner Mason predicted that credit during 1959 will be sufficient to equal this year's residential construction, estimated at between 1.1 and 1.2 million starts.

Besides the Administration's requests for mortgage insurance authority, Congress is expected to hear from exponents of funds for direct buying of home mortgages. A billion dollars was provided for that purpose by the 85th Congress, but the fund has been committed.

● Those favoring greatly expanded housing programs, including public housing and direct-financed mortgages, face a showdown with Administrationists concerned with inflation.

Housing Administrator Albert M. Cole holds the view that it is impossible to separate housing from the remainder of the economy when it comes to imposing controls to curb inflation. Such a plan, he contends, would pursue housing goals at the expense of stabilization.

● Whatever the outcome of the housing controversy, a long-range projection of great concern to air conditioning-heating-refrigeration industries has been issued by the Bureau of the Census. Entitled "Illustrative Projections of the Population of the United States, 1960 to 1980", the 25-page booklet blueprints future needs for schools, homes, and community facilities.

For example, by 1980 the youngsters of school age, 5 to 17, will total between 50 million and 74 million, compared with the present 40 million.

The projections start at 1960 and are continued at five year intervals to 1980, by age groups and sex.

● Possibly sparked by the foregoing and other startling projections, the Secretary of Health, Welfare and Education, Arthur S. Flemming, has again been urging a long-range estimate of requirements for educational facilities.

As a start, he said, the year-by-year cost of school construction during the next five years should be determined at once. At the same time, he believes, responsibility for carrying the load should be assigned to Federal, state and local governments, as well as private sources.

● Washington headquarters of the Air-Conditioning and Refrigeration Institute, while watchful of impending action on Capitol Hill, were constructively engaged in an industrywide project attracting wide interest and support.

The project—a certification program for unitary air conditioning equipment—

(Continued on page 8)

Get This Handy, Valuable 1 Page THERMAL CHART OF INSULATIONS, FREE!

It enables you to **select** at a glance the insulation required to meet any one or more of 119 different U, C, and R factors. (Also defines C, R, U, etc.)

ASSEMBLES for ready reference 82 types and thicknesses of metallic and non-metallic insulations. Thermal values for each are enumerated for heat flow: — up, down, and lateral; in winter and summer.

LISTS 201 various C and R factors, thicknesses and types in metallic and non-metallic insulations, and their respective U factors for ceilings, walls, and floors; in winter and summer.

LISTS 19 important U factors and what insulation C and R factors they derive from for the 3 major directions of heat flow. Also lists the thicknesses or types of metallic or non-metallic insulations required to obtain these U factors.

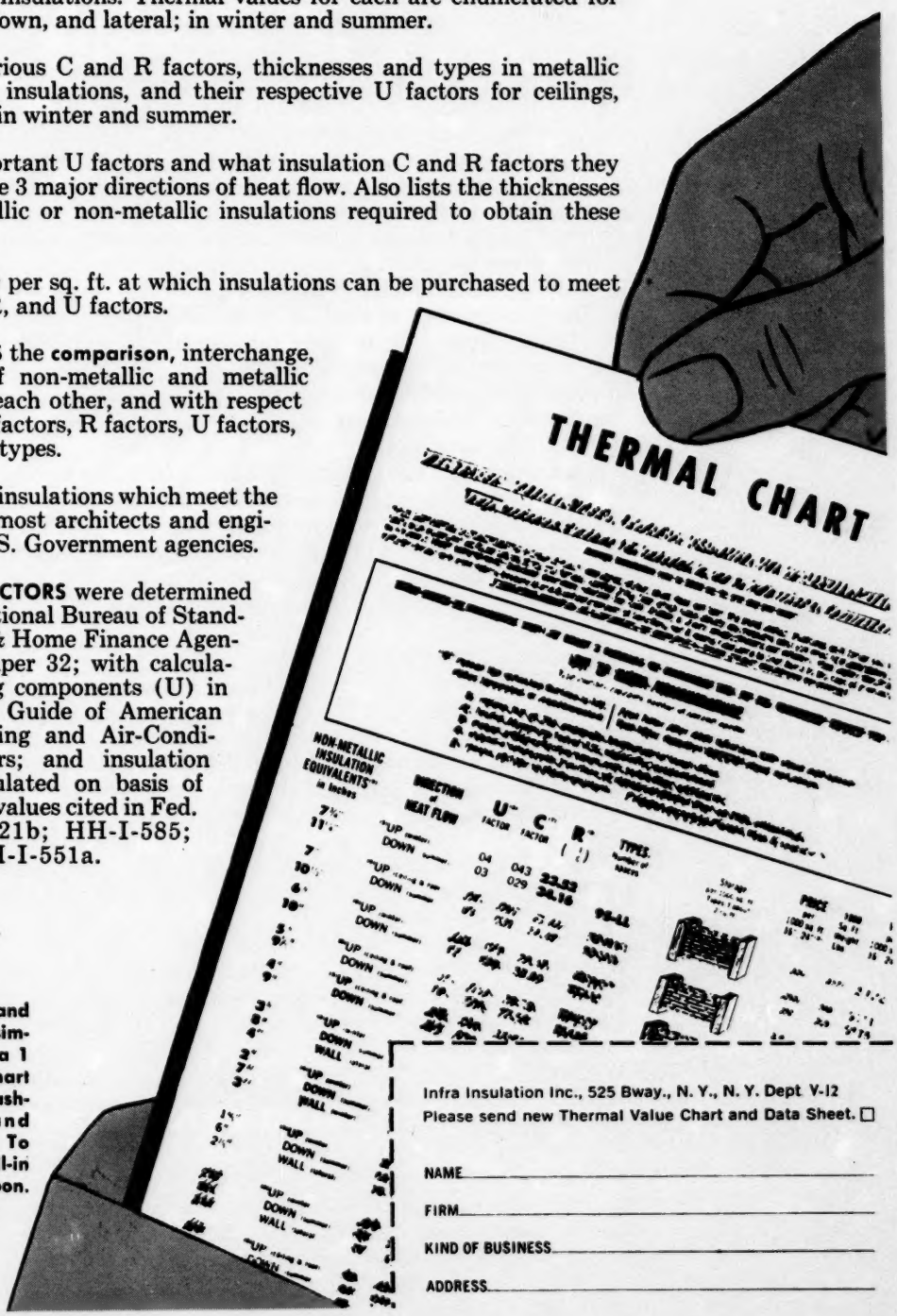
LISTS the **cost** per sq. ft. at which insulations can be purchased to meet 119 different C, R, and U factors.

ENUMERATES the **comparison,** interchange, or equivalents of non-metallic and metallic insulations with each other, and with respect to 201 various C factors, R factors, U factors, thicknesses, and types.

DESIGNATES insulations which meet the specifications of most architects and engineers, and all U. S. Government agencies.

THERMAL FACTORS were determined by method of National Bureau of Standards in Housing & Home Finance Agency's Research Paper 32; with calculations for building components (U) in accordance with Guide of American Society of Heating and Air-Conditioning Engineers; and insulation equivalents calculated on basis of limiting thermal values cited in Fed. Specs. LLL-f-321b; HH-I-585; HH-I-521c; HH-I-551a.

All the items and many more are simply presented on a 1 page illustrated chart in clear, concise fashion for easy and quick selection. To get a free copy, fill-in and mail the coupon.



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WASHINGTON OVERTONES *(Continued from page 6)*

is considered "one of the most powerful sales tools offered distributors, dealers, contractors and builders in the history of residential and small commercial air conditioning."

The program, effective January 1, was developed by the Unitary Air-Conditioner Section of ARI, with the cooperation of the National Warm Air Heating and Air-Conditioning Association. As explained by Coit Lytton, Lennox Industries Inc., chairman of the ARI section, "The program gives distributors, dealers and the trade generally—in addition to the good name of the manufacturer whose product they offer—the reputation of two national trade associations of manufacturers, backed by the results of thorough tests by an independent testing laboratory."

ARI reports 24 leading manufacturers, whose output represents 75% of the total U.S. production of unitary equipment, signed up for the program. Thousands of residential and commercial type air conditioners of less than 135,000 Btu per hr cooling capacity are affected. The manufacturers agree to test and rate their units in accordance with ARI standard 210-58; to supply the test data to ARI, and to permit random testing of units by an independent laboratory. Units not up to standard must be brought into compliance, or the right to use the national ARI certification seal may be withdrawn.

The Unitary Section of ARI has also authorized a national publicity and promotional campaign, to acquaint the public and the trade with the program and with the guarantee implied by the ARI seal.

The first directory of certified equipment will be ready for distribution by ARI in early January, with monthly supplements as new companies or models enter the program. The equipment directory will include central residential units, self-contained air conditioners such as used in commercial installations, and other combinations designated as units, but not room units or anything larger than 135,000 Btu in capacity.

Directories will be available to sales outlets, and to government officials—Federal, state and local—whose duties involve specifying and purchasing air conditioning equipment for government use. For consumers there is a pocket-size booklet informing the public of the advantages of air conditioning in general, and ARI-certified equipment in particular.

Members of the promotion committee held their first meeting in Washington on December 9 to make detailed plans for all segments of their program. The committee is headed by A. F. Ward, Worthington Corporation, formerly chairman of the Unitary Air-conditioner Section. Other committeemen: Sydney Anderson Jr., Airtemp Division, Chrysler Corporation, and James F. Brownell, Rheem Manufacturing Company. Among the promotional and publicity areas to be explored by the committee are the possibilities of a film for television use, purchase of space in trade and other publications to impress upon the trade and public the value of the seal.

● Estimates released by Departments of Labor and Commerce indicate that the 1958 construction total will reach $49.5-billion — about one billion more than was spent in 1957.

● Offices of Technical Services has released a report rating an air conditioner used by the Air Force to cool electronic equipment as "reliable, efficient, compact, and mobile". Unit delivers 36,000 or more Btu per hr; weighs 969 lb, and can be shipped by air and in 1½ ton trucks. Copies of the report, PB 151039 "Test and Evaluation of the MA-5 Air Conditioner", may be ordered from the Office of Technical Services, Department of Commerce, Washington 25, D.C. The 29-page booklet sells for $1.00.

● For the first 10 months of 1958, seasonally adjusted annual rate of private housing starts averaged 1,076,000 units, compared with an average of 988,000 for the same period in 1957. Starts in public housing through October totaled 64,300 — 41% above last year, and a seven-year high.

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ADJUSTABLE CAPACITY

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- INFINITE SELECTIONS
- LOW COST
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ENGINEERING SOCIETIES

Arthur J. Hess, president of Hess-Greiner & Polland, Los Angeles, Calif., is nominated for president of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, it is announced by the Nominating Committee of the Society. *Walter A. Grant*, vice-president and assistant to the president of Carrier Corp., Syracuse, N. Y., is the nominee for first vice-president, and *John Everetts, Jr.*, consulting engineer with Charles S. Leopold, Philadelphia, Pa., is slated for the post of 2nd vice-president. *John H. Fox*, vice-president sales, Honeywell-Controls, Ltd., Toronto, Ontario, Canada, who served as treasurer this year, is nominated to serve for a second term in this capacity. Nominees for a three-year term on the Council of the Society are: *William J. Collins, Jr.*, consulting engineer and head of his own engineering firm, Oklahoma City, Okla., *Harold A. Lockhart*, vice-president and chief engineer, Bell & Gossett Co., Morton Grove, Ill., *Rolland S. Stover*, owner of R. S. Stover Co., Marshalltown, Iowa, *George W. F. Myers*, owner of Myers Engineering Equipment Co., St. Louis, Mo. Candidates nominated to serve for three years on the Society's Committee on Research are: *Albert Giannini*, district manager, New York City office Carrier Corporation, *Richard C. Jordan*, professor and head, Department of Mechanical Engineering, University of Minnesota, *Maurice Nelles*, vice-president in charge of engineering, Crane Company, Chicago, Ill., *Herbert Nottage*, research specialist, Engineering Research Laboratory, Lockheed Aircraft Corp., Burbank, Calif., and *Paul H. Yeomans*, consulting engineer, Philadelphia, Pa. Elections and installations are scheduled to take place during the 65th Annual Meeting of the Society, January 26-29, 1959 in Philadelphia, in the Bellevue-Stratford Hotel . . .

W. Wilbur White, national president of the AMERICAN SOCIETY OF SANITARY ENGINEERING, will appoint a committee of three to consider the possibilities of a permanent headquarters for the Society and to study the financial structure of the Society and make recommendations. Plans for a more business-like arrangement are being actively considered. Mr. White cited the experience of the Michigan Association of Plumbing Contractors, of which he is a board member, where the hiring of the services of an executive secretary to promote membership and publish its monthly magazine has yielded excellent results . . .

Several hundred papers on advances in the electrical engineering profession are scheduled for the 1959 Winter General Meeting of the AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, R. T. Weil, Jr., Manhattan College, general chairman, has announced. The Meeting will be held February 1-6 in the Statler and Sheraton-McAlpin Hotels, New York City, with the former as headquarters. Each of the six Technical Divisions of the Institute will participate in technical sessions and symposiums. In addition to the technical part of the program, a dinner-dance and other entertainment are planned, and inspection trips will be made to the following: Abilities, Inc., Bell Telephone Laboratories, Brookhaven National Laboratories, Consolidated Edison Company's Astoria generating station, Holophane Light and Vision Institute, International Business Machines, Leeds and Northup Company, Leviton Manufacturing Company, The New York Times, Radio City Music Hall, Rambusch Decoration Company, Steinway Piano Company, Underwriters' Laboratories, United Nations Building, and Western Electric Company.

AMONG THE ENGINEERS

GUY B. PANERO ENGINEERS has moved into new headquarters at 630 Third Avenue, New York 17, N. Y., it was announced . . . Louis O. Britt, vice-president of the consulting engineering firm of DUDLEY DEANE AND ASSOCIATES, San Francisco, Calif., is promoted to general manager, and Donald R. Lundy has joined the company as chief mechanical engineer. Mr. Lundy was formerly with The Austin Co., Oakland, as senior mechanical engineer.

BURGEONING BUSINESS

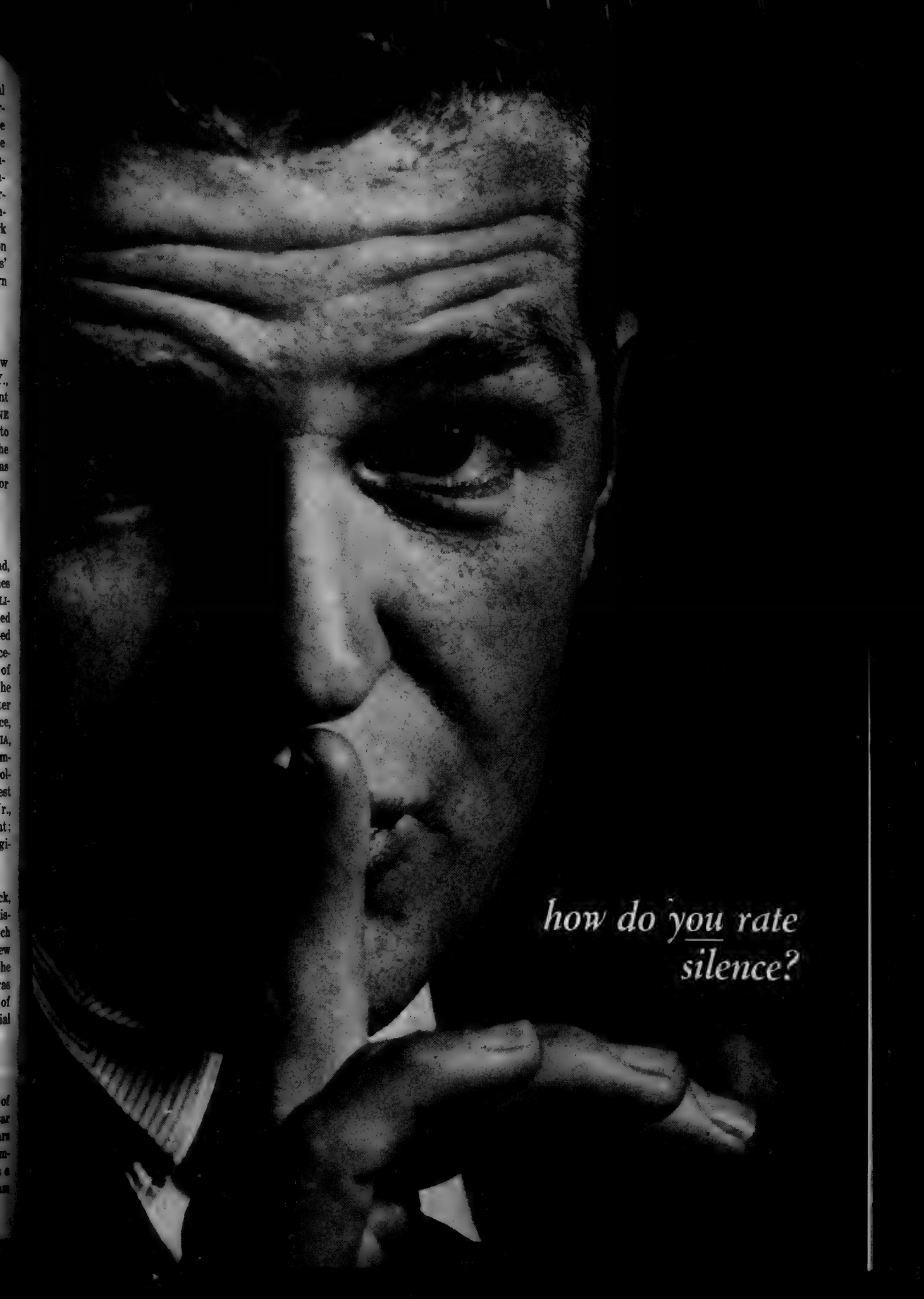
Effective immediately, FOWLER MFG. CO., Portland, Ore. gas and electric appliance manufacturer, becomes a wholely-owned subsidiary of REPUBLIC-ODIN APPLIANCE CORP., Los Angeles, Calif. and Erie, Pa. Estimated cost of acquisition is $1,250,000. Fred Fowler is named president of the subsidiary, Archie Schwieso, vice-president and plant manager. Paul Fowler, founder of the Portland firm, will continue as a consultant. The subsidiary will produce Republic gas and electric water heaters. . . . Merger of DOVER MFG. CO., Independence, Mo., and J. F. PRITCHARD AND COMPANY OF CALIFORNIA, Kansas City, Mo., is announced. The composite company, operating under the Pritchard name, offers cooling towers in a range of capacities from the smallest to the largest. Officers include: J. F. Pritchard, Jr., president; Karl E. Johnson, executive vice-president; and P. A. Frohwerk, manager of research and engineering. Offices are in Kansas City . . .

THE HOUSTON COMPANY, 3714 43rd Street, Lubbock, Tex., manufacturers representative, are appointed distributor of heating equipment, for a territory which includes 68 counties in Texas and 5 counties in New Mexico, for DRAVO CORPORATION, Pittsburgh, Pa. The company will sell Dravo's complete line of oil and gas fired units while also representing a notable group of manufacturers serving the commercial and industrial markets in this area.

UP ON TOP

At the November 3rd meeting of the Board of Directors of BUFFALO FORGE CO., Buffalo, N. Y., Edgar F. Wendt retired as president. After twenty-nine years in that capacity, and forty-seven years with the company, Mr. Wendt will continue an active interest as a director. To succeed him, the directors elected Willia

(Concluded on page 14)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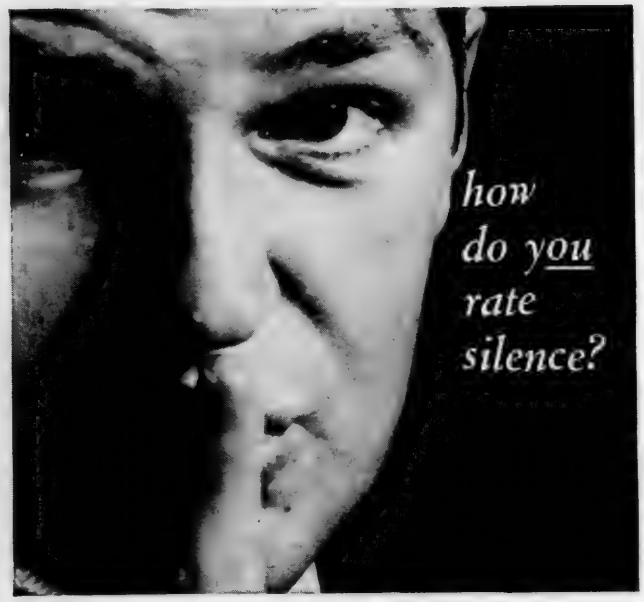
silence?



When it's ventilating equipment . . .

What factors are most important to men who specify ventilating equipment? What features do they look for first to make sure equipment is high quality?

A recent nationwide survey made by an independent research organization for Ilg throws considerable light on the subject . . . proves conclusively that "quietness of oper-

Here's how ILG *propeller fans assure quiet operation*

What's in a Name? Plenty—when the name is Ilg. This "One-Name-Plate" guarantee covers *both* the quiet-running, self-cooled motor *and* the dynamically balanced, patented design fan wheel. Whether you specify or install Ilg Direct Drive Propeller Fans, you can count on quiet, vibration-free operation, low operating costs. For Ilg Type "Q" Fans and Ilg enclosed motors are designed, built, assembled and tested under one roof to exhaust *more* air *more* quietly for *more* years.

"Silence Is Golden." Ilg Propeller Fans feature direct drive to eliminate the noise, slippage and friction losses of belts and pulleys. In addition to "quietness tests," all Ilg Fans undergo exhaustive balancing tests to motor rotors and fan wheels before and after assembly to assure smooth, quiet operation.

"Inhale . . . Exhale." Follow the flame and see why Ilg self-cooled, enclosed, permanently lubricated motors stay cleaner, run quieter, last longer. Fresh air (flame, here) enters vent pipe, circulates through motor, exhausts at front of fan. Ilg permanent-split capacitor single-phase and 3-phase motors never run "hot," have no wearing parts.

For fans built to satisfy your "specs"...

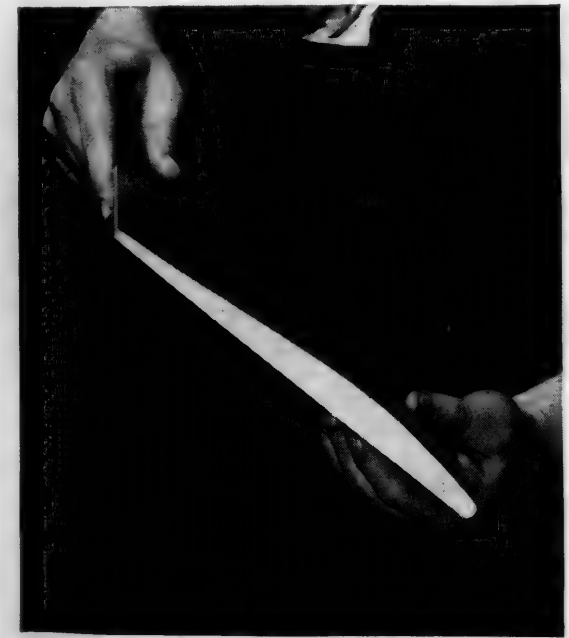
consulting engineers rate quiet operation No. 1 in preference poll

ation" rates *first* with consulting engineers who specify fans and ventilating equipment.

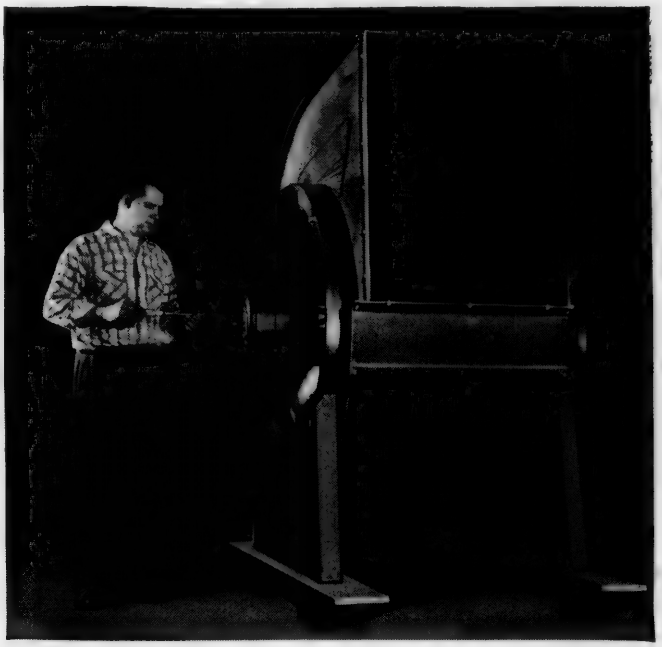
You can look to Ilg Fans and Ventilators for quietness coupled with high air volume. Consulting engineers choose Ilg because Ilg equipment combines so many of the points of quality they insist on: vibration-free operation, for example; long life; low maintenance expense; ease of repair; low operating costs—just to name a few.

Some of the reasons Ilg equipment rates so high with those who specify are shown below. For complete details on Ilg Propeller Fans, write for Catalog No. 153; on Ilg Airfoil Centrifugal Fans, send for Bulletin No. 257.

and ILG centrifugal fans vibration-free performance, low maintenance



Backward Is Forward. Ilg Backward Curved (BC) Blades and Airfoil design—the greatest step *forward* in blade design in 40 years—eliminate eddy currents and turbulence to assure quieter operation, undergo *less* drag and shock loss than blades of uniform thickness. Sound tests prove these fans can run at greater speed than older types —with *no increase in sound level.* For operations up to 9" static pressure.



Single, Silent Centrifugal. Direct-connected Ilg-built motors and Airfoil fan wheels rotate as a *single unit*—on heavy-duty, permanently lubricated ball bearings. No belts or pulleys to slip, re-align or replace periodically. No need for space-wasting separate motor mountings. Just connect an Ilg BC Airfoil Centrifugal and you're ready for any ventilating and air-conditioning job.

specify ILG

ILG ELECTRIC VENTILATING COMPANY
2851 N. Pulaski Road, Chicago 41, Illinois
Offices in 57 Principal Cities
Member of Air Moving and Conditioning Association Inc. (AMCA)

BRIEFLY STATED

(Concluded from page 10)

R. Heath President. Mr. Heath has been with the company for thirty-six years, starting in Engineering. He became chief engineer in 1948; director of manufacturing in 1951; a vice-president in 1953, and executive vice-president in 1955 . . .

Richard H. Lewin is appointed president of LEWIN-MATHES CO., St. Louis, Mo., a division of Cerro de Pasco Corporation. He succeeds the late Felix S. Dreyer, whose death occurred in October. Mr. Lewin was named executive vice-president of the Lewin-Mathes division following acquisition of the company by Cerro de Pasco in July, 1957 . . . Appointment of J. S. Newman as executive vice-president and general manager of JOSAM MFG. CO., Michigan City, Ind., its subsidiaries and affiliates, was announced. He occupies the position formerly held by his father, past president Leo N. Newman, who passed away in January of this year. . . .

Chester L. May, Dallas, Tex. gas industry leader, was elected chairman of the board of directors of ARKLA AIR CONDITIONING CORP., Shreveport, La. He had retired recently as senior vice-president of Lone Star Gas Company of Dallas, Tex. Also, Robert K. Eskew, the company's director of research, development and engineering, was made a vice-president. . . .

Fillip J. Kreissl is appointed president of DETROIT CONTROLS DIV., AMERICAN RADIATOR AND STANDARD SANITARY CORPORATION. He succeeds W. A. Haist, Jr. who resigned to become president of Sprague Meter Co., Bridgeport, Conn. . . . In a management reorganization of MORRISON STEEL PRODUCTS, INC., Buffalo, N.Y., Isadore Morrison became president; M. Jacque Kohnstamm, executive vice-president. Reappointed to their present offices are Arthur J. Harsch, vice-president in charge of engineering; Sheldon Weisberg, treasurer; Edward Kavinoky, secretary; and Anthony D'Ambrosia, controller.

Paul M. Augenstein is appointed president of AIRTEMP DIV., CHRYSLER CORP., Dayton, Ohio. He succeeds C. E. Buchholzer, who has resigned. Before joining Chrysler, Mr. Augenstein was general manager of room air conditioner activities for General Electric Company. Established in 1934, Airtemp Division is part of Chrysler's Special Products group headed by Group Executive Charles B. Gorey, Jr. Mr. Augenstein's appointment is part of the corporation's drive to capture a substantial share of the air conditioning industry's $700,000,000 annual volume, which the corporation believes will double in the next five years. Demand for passenger car air conditioning alone, it is said, has almost doubled since 1936.

HIGH TIMES

Valve, trap, and steam plant equipment manufacturer YARNALL-WARING CO., Philadelphia, Pa., celebrated its 50th year of operation at its Chestnut Hill plant on September 16 and 18. Over 400 customers, suppliers, distributors, and neighbors attended an Open House, and nearly 600 employees and their families were on hand two days later for a Family Night Dinner. Standing in the foyer at the Open House were Bernard G. Waring and D. Robert Yarnall, founders of the firm, greeting and shaking hands with the guests. . . .

One hundred and fifty-five guests were on hand at noon for the tee-off, and 265 had arrived by dinner time at the Winged Foot Golf Club, Mamaroneck, N. Y., at the Annual Golfing and Dinner hosted by COYNE & DELANY CO., Brooklyn, N. Y. Golfers competed for the coveted J. J. Delany Sr. Memorial Trophy, presented each year to the low scorer in memory of the firm's founder. Tim Hogan of J. R. Philips Co., contractors, won with a low gross score of 78.

AMONG THE MANUFACTURERS' PERSONNEL

Raymond K. Serfass is appointed manager of the air conditioning division of WESTINGHOUSE ELECTRIC CORP., Pittsburgh, Pa. succeeding Bruce D. Henderson, appointed to the staff of the executive vice-president. Since the time he became a student engineer with the York Corporation in York, Pa., Mr. Serfass has served a total of 25 years in the air conditioning industry. He progressed to vice-president, general manager, and director of that company. When the York Corporation merged with Borg-Warner Corporation, Mr. Serfass was appointed vice-president and director of operations for the York division of Borg-Warner, the position he held until his present assignment . . . W. P. Chapman is named director of research and development; H. W. Alyea, director of engineering; and John C. Spangler, director of manufacturing, for JOHNSON SERVICE CO., Milwaukee, Wis. Mr. Chapman, prior to joining Johnson in 1956, had spent six years in sales engineering and four years in research with National Tube Division of United States Steel Corporation. . . .

Norman F. Garrett is elected vice-president for manufacturing of CRANE CO., Chicago, Ill. He has been general manager of the company's Chicago manufacturing division since 1957 . . . G. G. Workinger, general sales manager, and Henry B. Williams, chief engineer, have been elected vice-presidents of MCQUAY, INC., Minneapolis, Minn. . . . Sam N. Craig is appointed chief engineer of ORR & SEMBOWER, INC., Reading, Pa. He has been associated with one of the largest manufacturers of steam power plants, and most recently has been responsible for design and development of fuel handling and burning equipment. . . .

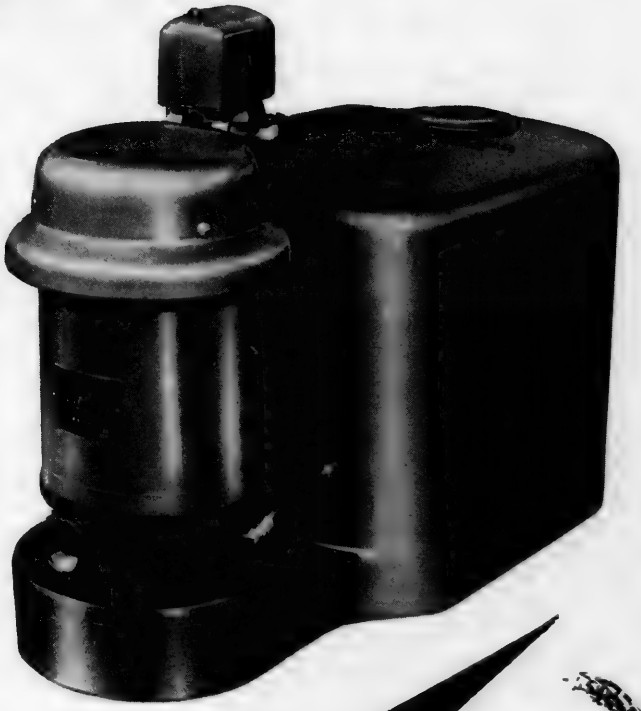
Robert Hughes is appointed director of research and development of DRAVO CORP., Pittsburgh, Pa., replacing W. L. Newhall, who retired after 33 years with the company.

Clyde E. Weatherwax, chairman of the board and one of the founders of ACME INDUSTRIES, Jackson, Mich., died October 13, 1958 at Jackson at the age of 76. Mr. Weatherwax, with his two brothers, founded the company in 1919 as a pipe coil manufacturer. He remained active in the affairs of the company until his death. He is survived by his son, Kenneth A., president, and his grandson, Peter A., executive vice-president of Acme Industries.

Skidmore Pumps

Here are the answers to— your Heating Pump Problems

NEW!
CLOSE-COUPLED
CCVS



Here's the NEW Skidmore CCVS Vertical Pump — offering a new pump efficiency — yet with a minimum motor size. Featuring new close-coupled design and mechanical shaft-seal . . . complete pump and motor unit is bolted to receiver . . . in sizes for all installations: Three new single units and two duplex units . . . can be installed on floor level or in pit. Write for your copy of new bulletin No. 21-C which fully describes these new, rugged, compact CCVS Skidmore Pumps.

This NEW single unit above has a 6000 sq. ft. EDR with 10 gallon receiver

CHOOSE WITH CONFIDENCE

SKIDMORE CORPORATION • ST. JOSEPH, MICHIGAN

Scientific Frontiers

The Revival of Thermoelectricity

Farms and pioneer settlements in many regions of the U.S.S.R., remote from electrical power grids, today enjoy the advantages of electric light, electrified machinery and radio, thanks to a new kind of generator. This generator has no moving parts, but converts the heat of a kerosene lamp or wood stove directly into electrical power. In the cities of the nation, apartment dwellers are soon to be furnished with an inexpensive refrigerator which operates on a quite opposite effect. This refrigerator has no motor or compressor and no refrigerant fluid; it uses electrical energy directly to pump the heat out of its interior. A variation of this effect applied to the heating of indoor working and living spaces promises to achieve great economy in the use of electrical energy for such purposes.

So states Abram F. Joffe, a leading Soviet physicist and member of Russia's central scientific body, the Academy of Sciences, in which he heads the Institute of Semiconductors, in the November issue of *Scientific American*. In a visit to the U.S. earlier this year, Mr. Joffe found scientists and engineers also fired with these possibilities and working actively to realize them. Examples: a clock-controlled bottle warmer and cooler, and mobile hostess cart with both refrigeration and oven compartments (this page, August, 1958); also a "hot-cold-light" panel which combines into a single operating unit thermoelectric refrigeration and electroluminescent lighting (News of the Month, this issue).

Likening thermoelectricity, the direct transformation of thermal energy into electrical energy (noted in 1821 by Thomas Seebeck) and the reciprocal transformation of electrical energy into heat (noted in 1834 by Jean Peltier), to legend's sleeping princess, Mr. Joffe depicts the semiconductor as the prince who awakened her from a hundred-year nap. In 1926, a U.S. engineer named Lars O. Grondahl showed that an oxidized copper plate conducts an electrical current easily in one direction, but offers a very high resistance in the other. Thus if an alternating current is passed through such a plate, the current will flow for all practical purposes only in one direction. The discovery of these properties in copper oxides attracted the attention of physicists to the large class of materials with low electrical conductivity which we now know as semiconductors.

Regarding power generation by thermoelectricity, the author states that for small power requirements where only a few kilowatts of electricity are required, thermoelectric generators can compete with steam engines. For very low power requirements, as in radio, telegraph and telephone communications, thermoelectric generators provide the best engineering solution.

What occurs in heating by thermoelectricity is at first glance unexpected. In order to heat a room with an ordinary electric heater at the rate of a kilowatt, the heater must also use up electrical energy at the rate of a kilowatt. But if thermoelectric cells (circuits containing two dissimilar semiconductors) are used for this purpose, the expenditure of half a kilowatt or less will yield the same result. One might think that thermoelectric cells shake the very foundation of science: the law of conservation of energy. But of course this is not so.

This extra heat supplied to the room is not created from nothing, but is transferred from a colder source, such as from the water supply. The thermoelectric cell, acting as a "heat pump", removes heat from the water and transfers this heat to the room together with the heat supplied by the current. Even though the heat reservoir may be at a low temperature, its heat can be delivered at a higher temperature by means of thermoelectric cells. The less the temperature difference between the reservoir from which the heat is removed and the warm one to which it is supplied, the less electrical energy is needed.

PREMIUM QUALITY—MODERATELY PRICED

Each valve individually tested

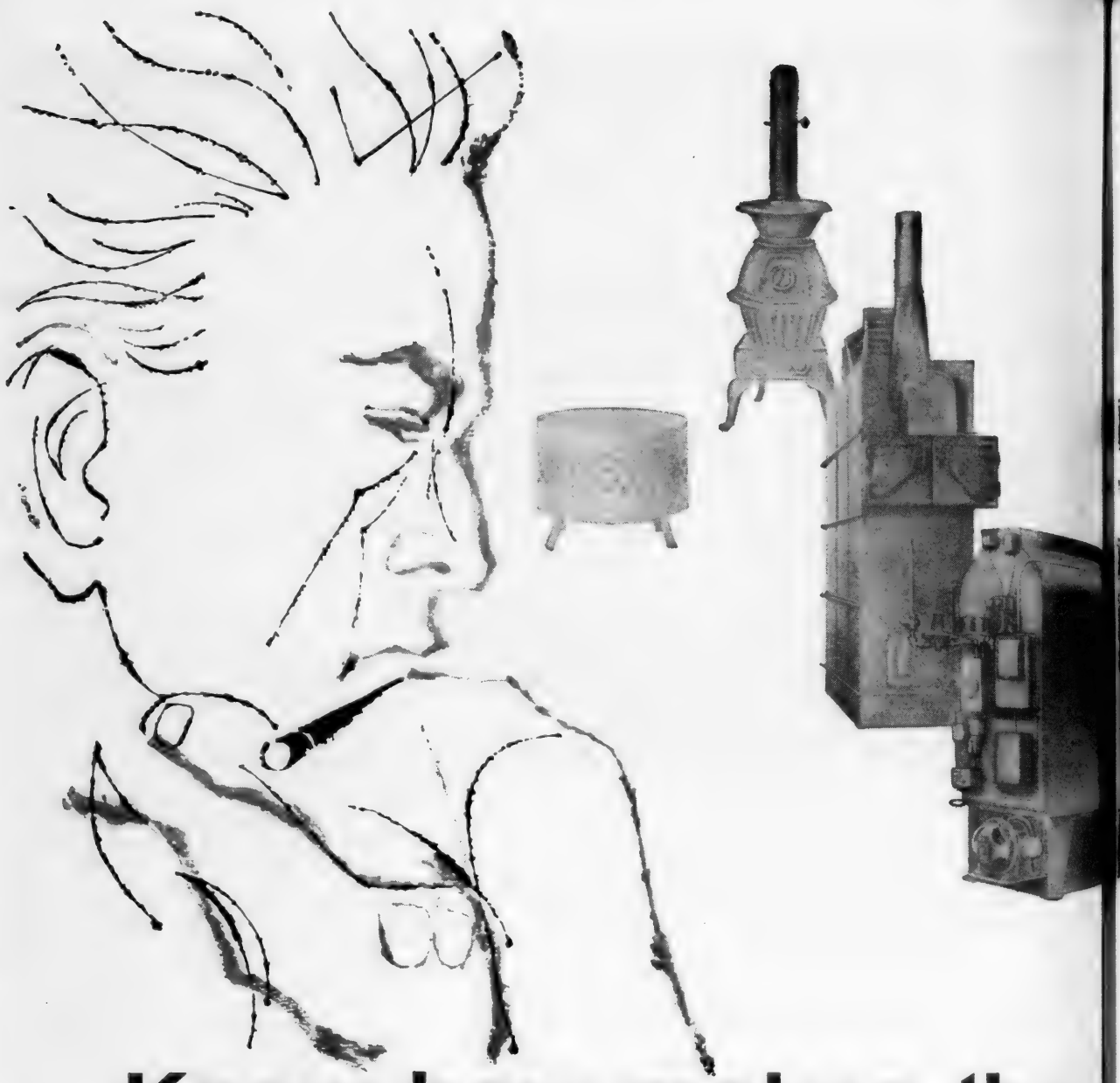
Before it leaves the factory, each Hammond Bronze Valve is individually pressure-tested for perfect closure. For example the Number 619 gate valve above is rated for 150 lbs. Before passing final inspection it must prove drop-tight under an individual hydrostatic test at 300 lbs., as shown. This individual testing is typical of the many rigorous checks and inspections that verify Hammond quality—quality second to none in the valve industry.

Hammond manufactures bronze valves exclusively—and rigorously controls every step from the melting of the virgin ingot to final individual testing. High volume production, in a modern, "automation" factory, permits economies which are reflected in moderate prices for valves of outstanding quality.

Write today for your copy of our new catalog No. 158 describing Hammond's complete line. Address Hammond Valve Corporation, Hammond, Indiana.

Hammond Number 413 globe valve is rated for steam service up to 150 lbs., 300 lbs. W.O.G. Has slip-on composition disc, union bonnet, stuffing box, gland follower. Complies with Federal spec WW-V-51A, Type 1, Class B.

HAMMOND *BRITE-KOTE*® BRONZE VALVES



Know-how makes the

IN HEATER APPLICATION

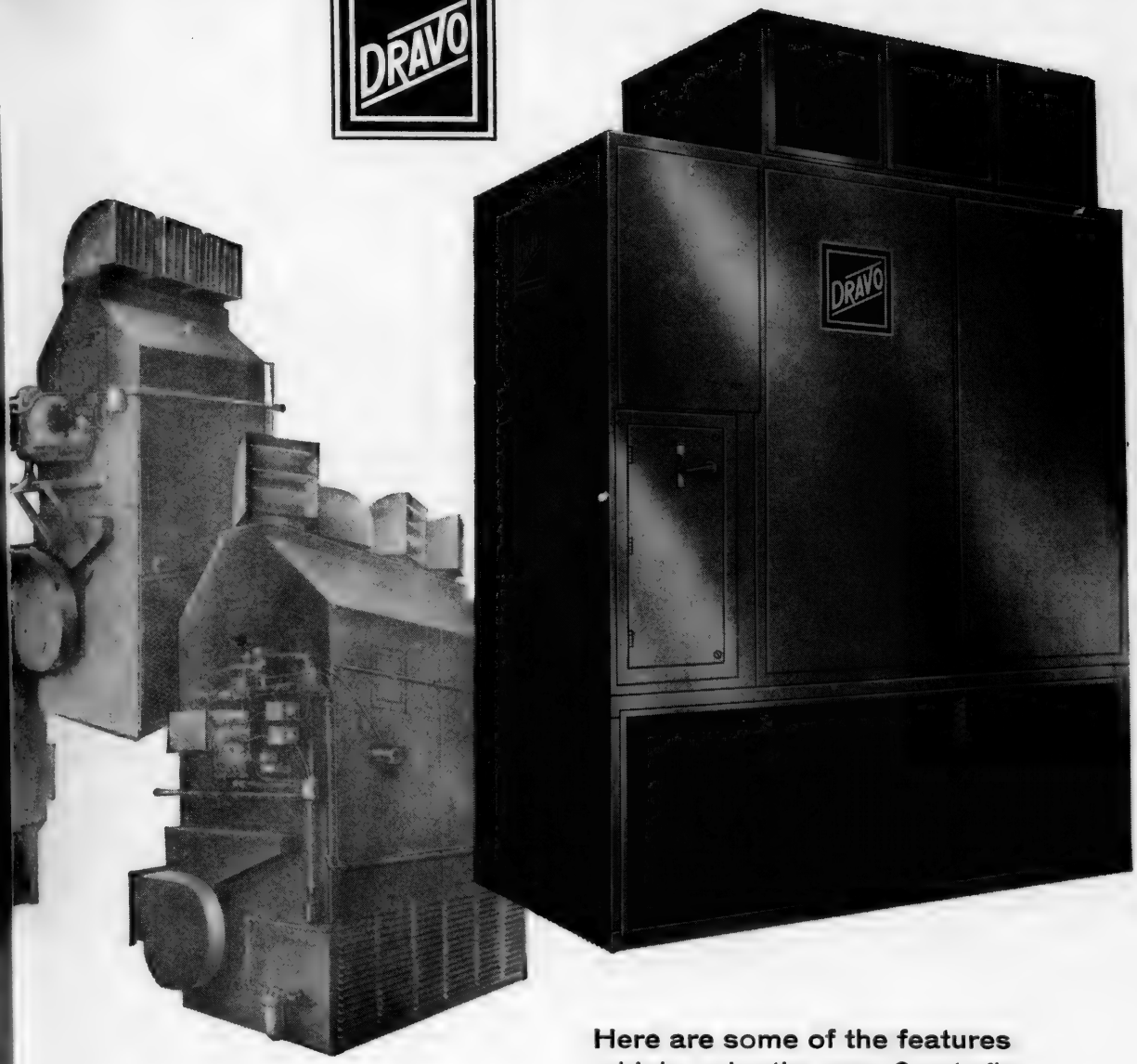
The new Dravo *Counterflo* has performance built in . . . the kind of performance possible only in a heater in which every part has been designed and built to function as an integrated unit. But it is the skill with which this performance is applied to the solution of a specific heating problem that makes it completely effective.

This is the important "extra" that every Dravo Heater customer gets. *Every* Dravo technical representative *is a qualified heating engineer* skilled at solving all kinds of heating problems in all types of industrial and commercial buildings.

Every man is competent to make a complete heating survey of your installation, working in cooperation with your engineering departments or consultant.

Every man is backed by the home office staff, who can bring both laboratory facilities and the total experience of over 10,000 installations to bear on unusual problems.

Get the benefit of this Dravo "extra" when *you* have a heating problem.



difference

IN HEATER DESIGN

The new Dravo *Counterflo* heater, developed by an exhaustive research program, represents an important advance in warm air space heating. Its "unitized" design, making each part integrate smoothly with the functioning of the rest, and the fact that each part was designed specifically for its function, makes the new *Counterflo* unique.

DRAVO
CORPORATION

Here are some of the features which make the new *Counterflo* heater your best heating buy:

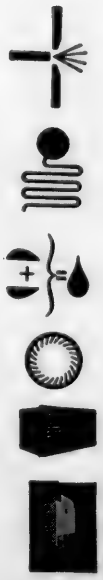
NEW PYROJET BURNER—exclusively Dravo—first burner developed specifically for direct-fired space heaters. Burns low cost oils efficiently. Switches from gas to light oil automatically.

NEW INDUCED DRAFT FIRING—automatically controls fuel/combustion air ratio, high negative pressure in combustion chamber adds extra safety; extra efficiency because of complete control of combustion air.

NEW AIRFOIL COMBUSTION CHAMBER—stainless steel, ribbed for extra strength and channeling of airflow—guaranteed for 10 years. Longest possible flame travel for complete combustion within primary heat transfer area.

NEW LOW-SPEED FANS—forwardly curved, low-speed, double inlet fans with high efficiency reduce horsepower requirements in the new Counterflo drastically, operating costs are lower.

NEW DISCHARGE PLENUM—distributes heated air at high velocity without annoying drafts. Adds new flexibility to warm air distribution patterns.

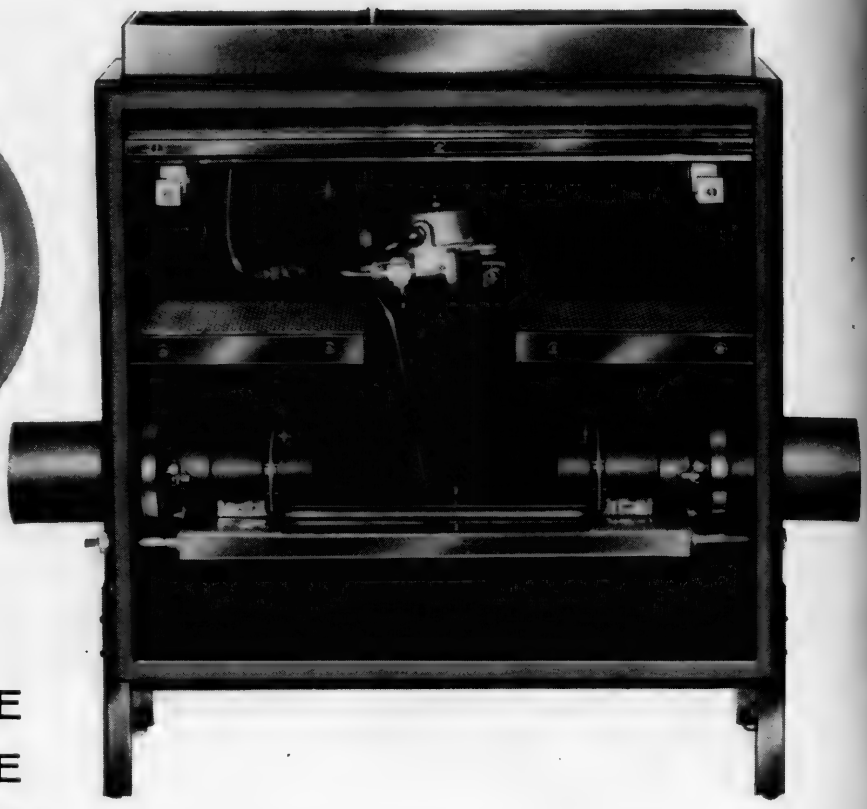


Bulletin 564 describes the many new features of the new Dravo Counterflo heater. Write or phone for your copy today. Address Dravo Corporation, Dravo Building, Pittsburgh 22, Pennsylvania.

NEW

CON-VOL EQUIPPED HIGH VELOCITY UNITS

CONSTANT VOLUME UNDER ALL CONDITIONS



EXCLUSIVE FEATURE ASSURES PRECISION CONTROL OF AIR VOLUME AND TEMPERATURE

The new Thermotank Con-Vol Unit delivers constant air volume over a wide range of varying inlet pressures. Instant response and positive valve closure are obtained due to the complete absence of linkage or complicated operating mechanism. Both the hot and the cold valves are regulated by the flow controller as conditions demand. An access door permits inspection of all moving parts and easy removal of valves and controls. For more information on Con-Vol equipped units ask your Thermotank-Agitair representative or write direct to Air Devices Inc.

THERMOTANK — AGITAIR

high velocity units • punkah louvers
air diffusers • filters • exhausters
registers and grilles

Sold exclusively by representatives for:

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Mr. Readi-Pakt, Right There at the Top

Way up on top of the highest peak in the world, stands our hero, Mr. Readi-Pakt! Ask him how he got there, and he'll tell you there's only one way to climb a mountain—step-by-step. That's how Reading Tube reaches the quality-peak in copper and brass tube and pipe — through step-by-step supervision by specialists in a wholly integrated mill — from its own refinery to its own depots. It's the only way to get C.Q.C. (Complete Quality Control). It's the only way to produce a quality product second to none. Coupled with personalized service and efficient delivery it explains why Reading Tube continues to stand right there at the top!

IN TUBING — *Nothing Beats Copper* —
IN COPPER — *Nothing Beats READING!*

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READING COPPER BRASS TUBE
And RED BRASS PIPE

MADE IN U.S.A. TO THE STANDARDS OF AMERICAN INDUSTRY

G.I. FANS
for BIG
performance...
nyb

...featuring flat radial blade wheels

THREE WHEEL TYPES FOR RUGGED PERFORMANCE

Because of the varied demands of industry, three wheel types are offered to provide optimum performance for virtually any type application.

LS Type—designed for coarse materials and abrasive particles . . . ideal for sticky, heavy or abrasive dust problems . . . extremely easy to clean . . . also for corrosive or heavy fumes . . . for temperatures to 800° F.

RIM Type—used in similar applications to LS Type, and comparable in performance . . . for higher temperatures, RIM Wheels are available for operation to 1000° F.

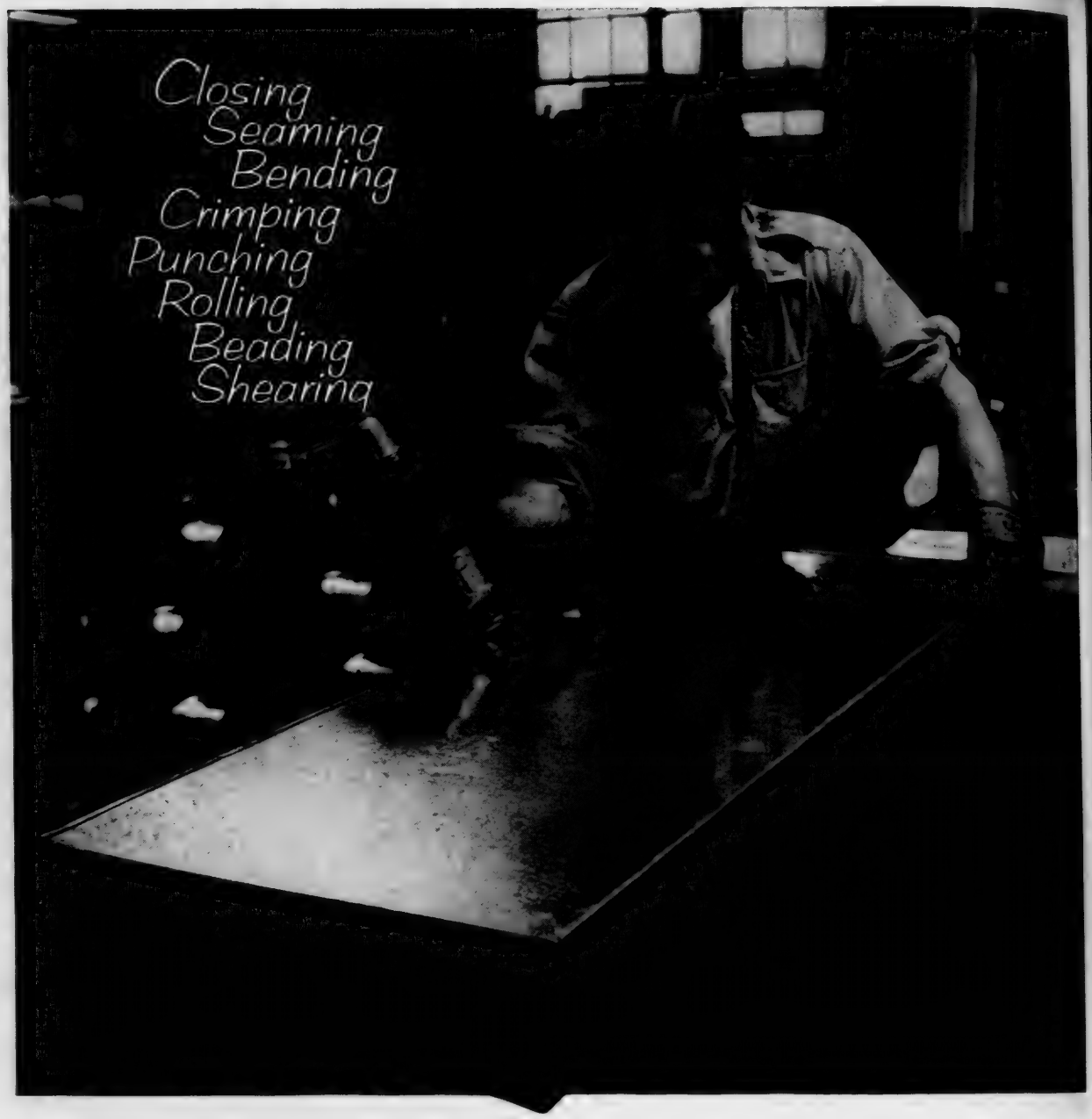
LM Type—high efficiency design, ideal for industrial process systems involving smoke, gases, or air containing small quantities of fine dust . . . provides efficient fume removal . . . for operation to 800° F.

A packaged industrial fan is also available, in sizes 141 through 361. Economically designed, it features one-man motor installation and removal.

Write for details in Bulletins 585, 586

THE NEW YORK BLOWER COMPANY

Sales Offices: 3147 South Shields Avenue • Chicago 16



. . . The zinc holds tight on a Bethcon sheet

Put it through the toughest operation in your shop . . . a Bethcon galvanized steel sheet will do all you ask of it. The coating comes through intact as the sheet forms up into a strong and rigid finished product.

Bethlehem's continuous galvanizing process includes a special annealing cycle which gives the basic steel sheet its ideal blend of strength and ductility. Moments later, the zinc is applied, and applied so tightly that it permits forming never before considered practical for galvanized steel. You really ought to try Bethcon for yourself in order to fully appreciate its true advantages. It is available in both cut lengths and coils, in gages 12 and lighter, with either plain open hearth or copper-bearing (Beth-Cu-Loy) steel for the base metal. A Bethlehem representative will gladly work with you in running some tests. Just get in touch with the nearest Bethlehem sales office.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

Remove Condensate and Air without STEAM LOSS with

HOFFMAN STEAM TRAPS

Guardian of your Fuel and Comfort

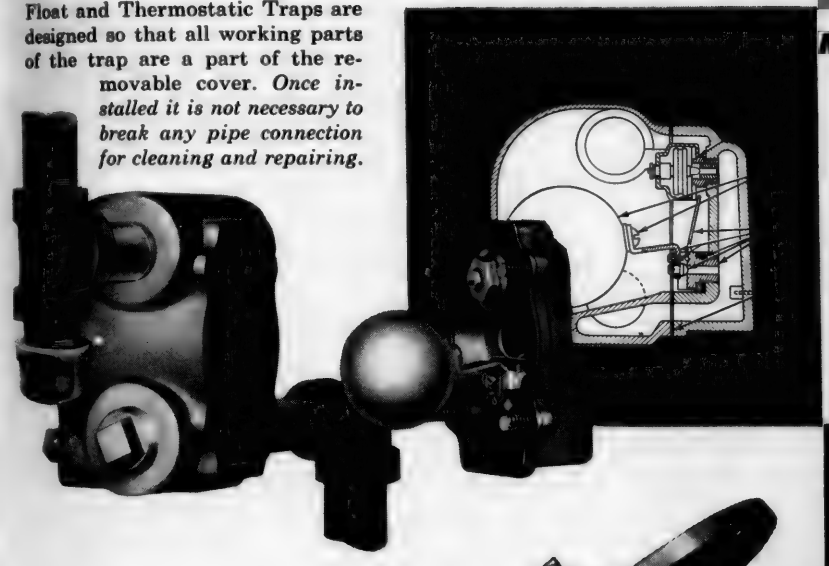
Hoffman Traps incorporate design features which assure both effective *and* economical removal of condensate from steam lines and equipment. Typical of Hoffman's complete line are the Traps illustrated, each with removable cover, pin and seat for quick inspection and cleaning.

LOW, MEDIUM and HIGH PRESSURE THERMOSTATIC TRAPS with RENEWABLE THERMOSTATS and VALVE SEATS

A complete line of Low, Medium and High Pressure Thermostatic Traps for service with radiation, dryers, sterilizers, mangles, cookers and similar uses. *Renewable thermostats and seats are important constructional features contributing to long life and low cost service.* Medium and High Pressure Traps have stainless steel pins and renewable seats.

50 SERIES F & T TRAP

Float and Thermostatic Traps are designed so that all working parts of the trap are a part of the removable cover. *Once installed it is not necessary to break any pipe connection for cleaning and repairing.*



MAINTENANCE COST

1. Complete Thermostat Assembly
2. Durable, accurately machined Valve Lever and Seat Assembly
3. Copper Float Ball Assembly
4. Graphite Impregnated Asbestos Gasket
5. Heavy Duty Cast Iron Cover

600 SERIES INVERTED BUCKET TRAP

Hoffman Bucket Traps operate intermittently and are ideal for draining condensate and air from steam lines or equipment where large quantities of air and condensate must be discharged. *They are easily inspected, cleaned and serviced by merely removing the cover.*

HOFFMAN
SPECIALTY MANUFACTURING CORP.
1700 WEST 10th STREET, INDIANAPOLIS 7, INDIANA

Valves, Traps, Vacuum and Condensation Pumps, Forced Hot Water Heating Systems, stocked and sold by leading Wholesalers of Heating and Plumbing Equipment.

For full particulars, write for catalogs on Bucket Traps, Float and Thermostatic Traps or Thermostatic Traps.

Underground Heat Distribution Systems

How To Protect A System Against Failure

Specifications are the *only* way a designing mechanical engineer can be assured the final project will have met his required standards and be of the quality the owner bought.

Three major elements make up an underground heat distribution system: an inner pipe to convey steam, high temperature hot water, chilled water, condensate, etc., (type and size depending upon project requirements); the insulating of the inner pipe to minimize heat loss; and the outer casing to protect the insulation and inner pipe.

The outer casing has to be specified in such a way that it will provide positive protection against moisture entrance and accumulation. Saturated insulation, of course, equals low efficiency. Moisture, present constantly in buried pipe, accelerates corrosive action which is amplified in acidic and electrolytic soils.

Testing welded joints by applying a soap solution with the casing under 25 p.s.i.g.

To be positively leak tight the casing must be tested air tight. The engineer should specify a 25 p.s.i.g. air test on the casting for two consecutive hours without a drop in pressure.

In order to prevent accumulation of moisture, the casing should be specified with a smooth interior.

Impact from above and earth back fill weight is a problem the engineer resolves by specifying a 14 gauge steel casing with a spiral lockseam for added crush resistance.

Now knowing that his casing is impact and water proof he protects the casing by specifying an anti-corrosive compound that will withstand a 15,000 volt spark test and have a permeability of .05 perms or less.

With the casing and joints sealed leak tight and protected against electrolysis and sub-soil acids he needs only one bit of . . .

Final Protection

Any system should be selected with this thought in mind:

"That some moisture will find a way into the system such as a rain storm prior to installation."

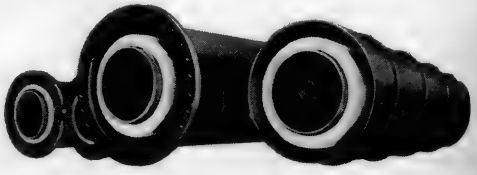
Therefore, to protect the system against any moisture that may get inside prior to final assembly, he specifies "that an annular uninterrupted air space must run the entire length of the system." With this feature and openings at ends of casing for draining and venting, he can force ventilate the system and dry it out. By necessity, the insulation must, of course, have an insoluble binder and be capable of returning to its original insulating efficiency when dry, even after a thorough saturation.

For a free 24 page catalog with facts and figures for designing and specifying underground heat distribution systems, write: E. B. Kaiser Co., 2114 W. Lake Ave., P. O. Box 47, Glenview, Illinois.

". . . for highest quality"

EBKO

PIPING SYSTEMS



1st National Bank Building, Tulsa, Okla., is equipped with B&G Monoflo Fittings. Carson and Lundin, Architects.

NEVER HAS A PROPERLY DESIGNED B&G *MONOFLO*® SYSTEM FAILED!

From small residence to the largest conceivable installation, B&G Monoflo Fittings assure a correctly balanced one-pipe forced hot water system.

B&G Monoflo Fittings enable you to design a one-pipe forced hot water heating system of any size with assurance that it will be correctly and efficiently circulated. That's because the Monoflo Fitting is an *engineered* device—not just a "scoop' or "choke."

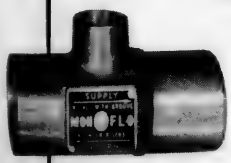
These Fittings are designed to handle definite radiator sizes, maintain proper temperature drops and permit the use of economical riser sizes. They provide adequate diversion under average conditions *without introducing excessive resistance.*

An exclusive feature of B&G Monoflo Fittings is that there is virtually no limit to the number which can be installed in any circuit of a one-pipe forced hot water system. Design problems which otherwise occur are eliminated.

Complete design procedure for B&G Monoflo heating systems is found in the B&G Handbook.

Heat in this residence is properly distributed by B&G Monoflo Fittings

NEW "RED-RING" COPPER MONOFLO®



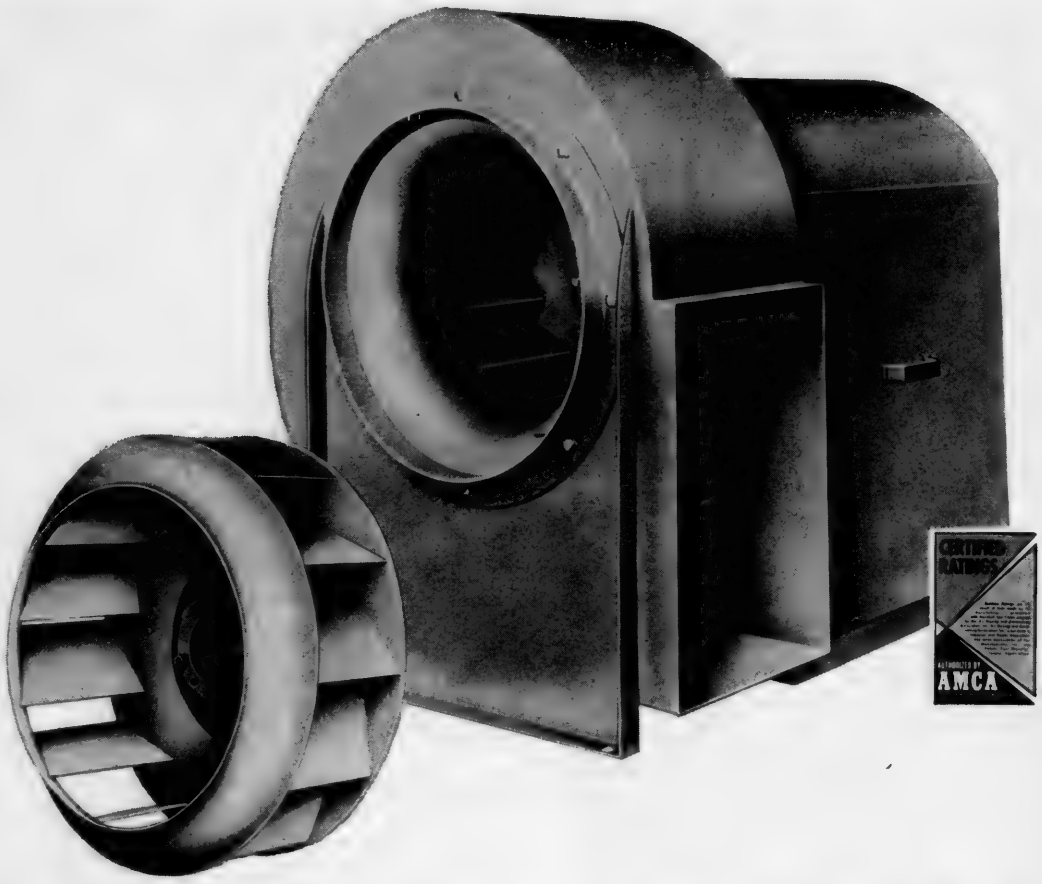
Made in 1″ and 1¼″ sizes, the "Red-Ring" can be used for up-feed, down-feed, supply, return, one or two-fitting installations. Just keep the "red-ring" *between* the risers.

Reg. U.S. Pat. Off.

BELL & GOSSETT COMPANY

Dept. FN-4, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto 16, Ontario



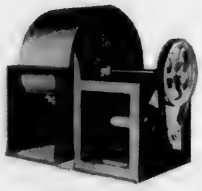
Backward Curve Blowers—Certified Ratings

Completely Designed, Engineered and Manufactured by Peerless Electric

Peerless Backward Curve Blowers are all Peerless—motor and all. We control the entire production of this versatile blower, from drawing board to finished product. We guarantee it unconditionally for quiet, trouble-free operation.

Peerless Backward Curve Blowers can be specified with confidence. They are thoroughly tested according to test codes. They meet AMCA and NEMA standards. Scores of them are operating in schools, churches, hospitals and government installations.

Send for Catalog 200 today!



FORWARD CURVE BLOWERS

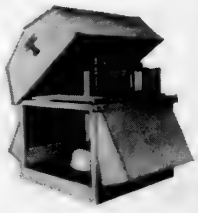
Made entirely by Peerless; arc-welded housings and frames; wheels designed for quieter operation; dynamically balanced.

Send for Catalog 240.

CENTRIFUGAL ROOF VENTILATORS

Matching wheel cone accurately fits spun venturi for quieter, smoother air movement. All welded construction; material 16 ga. or over. Each unit air tested, and rated to assure certified AMCA ratings. Fits standard curbs.

Send for Catalog 220.



Member of the Air Moving and Conditioning Association, Inc. (AMCA)

Peerless Electric®

FAN AND BLOWER DIVISION

THE Peerless Electric® COMPANY

1400 W. MARKET ST. • WARREN, OHIO

FANS • BLOWERS • ELECTRICAL MOTORS

Locate Your Nearest Representative in the "Yellow Pages"

SEE OUR CATALOG IN SWEET'S

Where quality counts . . .

Specify RECO

General Contractor, Atlantic Construction & Engineering Co.; Mechanical Contractor, Cross Plumbing Co., Ft. Lauderdale; Engineers, Obeler & Clarke; Architects, Gibbs & Mackay; RECO Representative, Essex Heating & Air Conditioning, Miami.

TWO RECO CEMENT-LINED HEATERS SERVE NEW GALT OCEAN MILE HOTEL

From window glass to heating system, *quality* was the keynote at the beautiful new Galt Ocean Mile Hotel. This luxurious $3,000,000 building is the first of 25 new hotels to be built on a one mile, $19,000,000 stretch of beach inside the city limits at Fort Lauderdale, Florida.

Of course *delivery* and *price* were important factors, too. Two RECO Cement-lined Hot Water Storage Heaters (48" x 192" and 48" x 264") "more than adequately" met all three of these requirements according to William D. Cross, Mechanical Contractor.

RECO offers you a complete line of heat exchange equipment—all ASME inspected and guaranteed. Write for 20-page storage heater catalog showing dimensions, diagrams and details. Address RECO, Dept. C, 7th and Hospital Sts., Richmond 5, Va.

CONVERTERS STORAGE HEATERS INSTANTANEOUS HEATERS HEAT RECLAIMERS STORAGE TANKS

RICHMOND ENGINEERING CO., INC.

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Convention Hall Philadelphia January 26-29, 1959

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Where You Get a Clear View of New Products ...cost saving ideas...latest methods...

Thousands of the industry's leaders find this Exposition their best way to keep up with the newest developments. Join them and see first-hand the most complete array of the newest products for all types of heating, ventilating, cooling and air-conditioning applications.

See the latest and best products on display. Discuss your problems and plans with informed representatives of some 450 leading manufacturers. Get new ideas. The Show is the place to do it.

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480 Lexington Avenue, New York 17, N. Y.

Management: International Exposition Company

No Matter what the Size...

Sporlan gives ANY Air Conditioning Installation PEAK PERFORMANCE

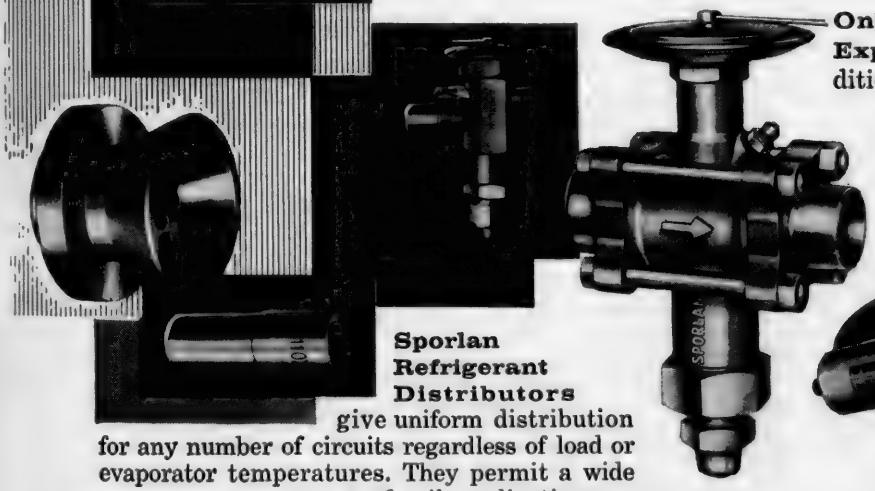
Right Down the Line!

Systems from ¾ to 100 tons are kept perfectly dry with the famous **Sporlan Catch-All** filter-driers.

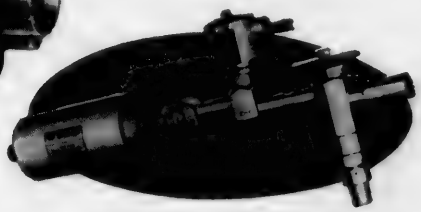
THE *See-All*

The amazing new **Sporlan See-All** shows you at a glance the degree of dryness and the amount of refrigerant the system is carrying.

Sporlan Solenoid Valves with the Power Packed Blue Seal Coil defy burn-outs.



Only Sporlan Thermostatic Expansion Valves for air conditioning offer the Flow Master element, which minimizes valve hunting... smooths out evaporator performance regardless of size.



Sporlan Refrigerant Distributors give uniform distribution for any number of circuits regardless of load or evaporator temperatures. They permit a wide range of coil applications... thanks to the Sporlan interchangeable nozzle!

Buy Sporlan Right Down the Line from your wholesaler for your next air conditioning installation, and no matter what the size of the job, Peak Performance Right Down the Line will be yours!

We are expecting you at **Booth 52**

SPORLAN VALVE COMPANY

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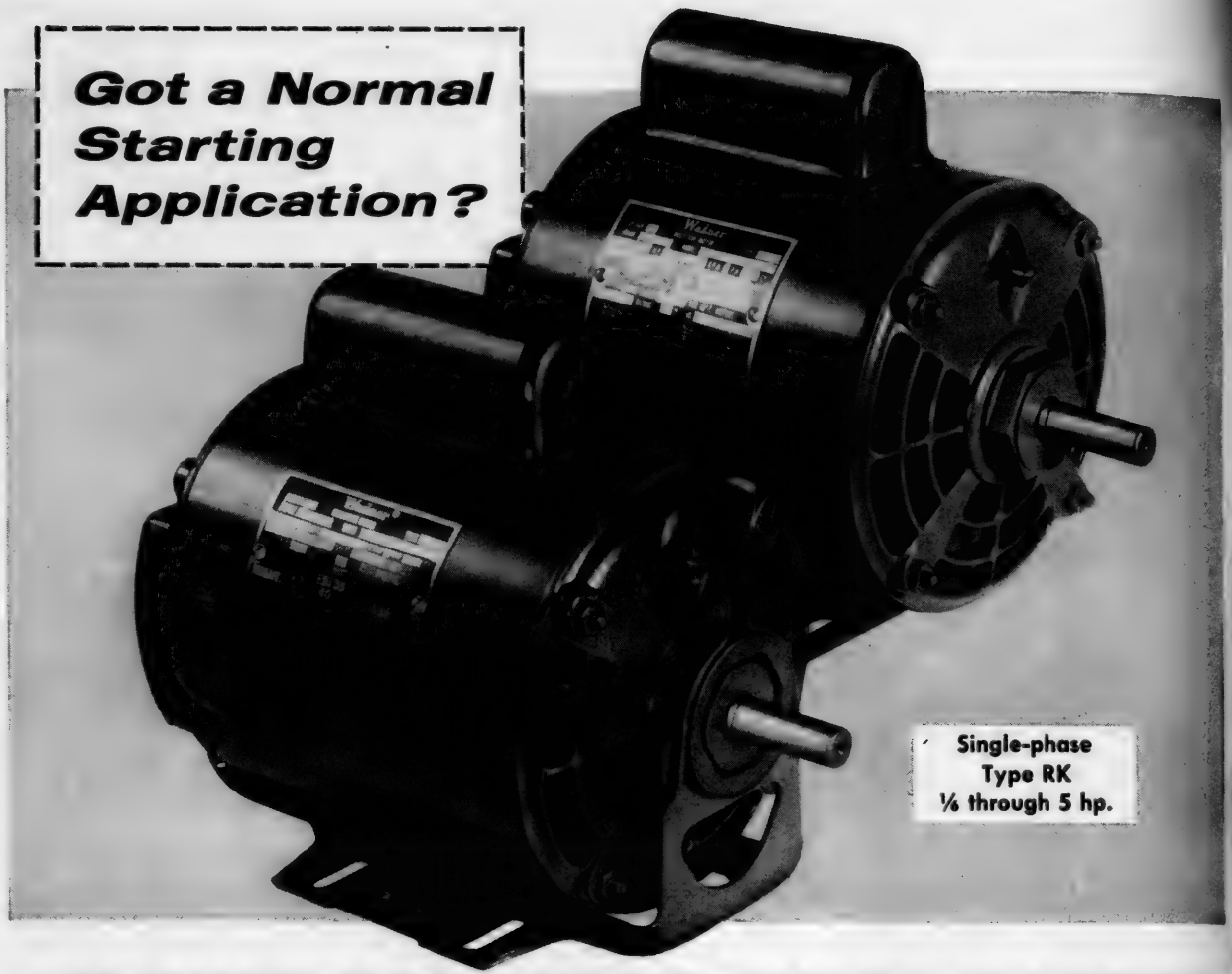
14TH INTERNATIONAL HEATING and AIR CONDITIONING EXPOSITION - JANUARY 26-29, 1959

CONVENTION HALL • • • PHILADELPHIA, PA.

Got a Normal Starting Application?



Single-phase
Type RK
⅙ through 5 hp.

WAGNER CAPACITOR-START MOTORS

provide dependable starts... long troublefree life

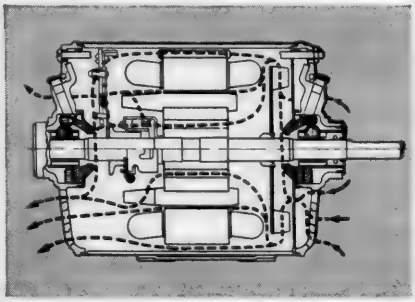
Here's the single-phase general purpose motor that gives more horsepower with less bulk—is rugged enough to permit direct mounting, compact enough to fit in tight spots. Available with sleeve or ball bearings—with rigid bases or with resilient mountings for exceptionally quiet operation.

ALL-ANGLE OPERATION—The sleeve bearing design in fractional hp ratings, has a positive lubrication system that permits operation in any position. All angle mounting can mean important savings in initial costs to manufacturers—can help the design engineer in a tight spot. You can get these motors from leading motor distributors in your community and from Wagner Sales Offices in 32 principal cities. Your Wagner Sales Engineer will be glad to help you select the right motor for your application. Wagner Bulletin MU-217 gives full details.

Wagner Electric Corporation 6463 Plymouth Ave., St. Louis 14, Missouri.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

WM58-7



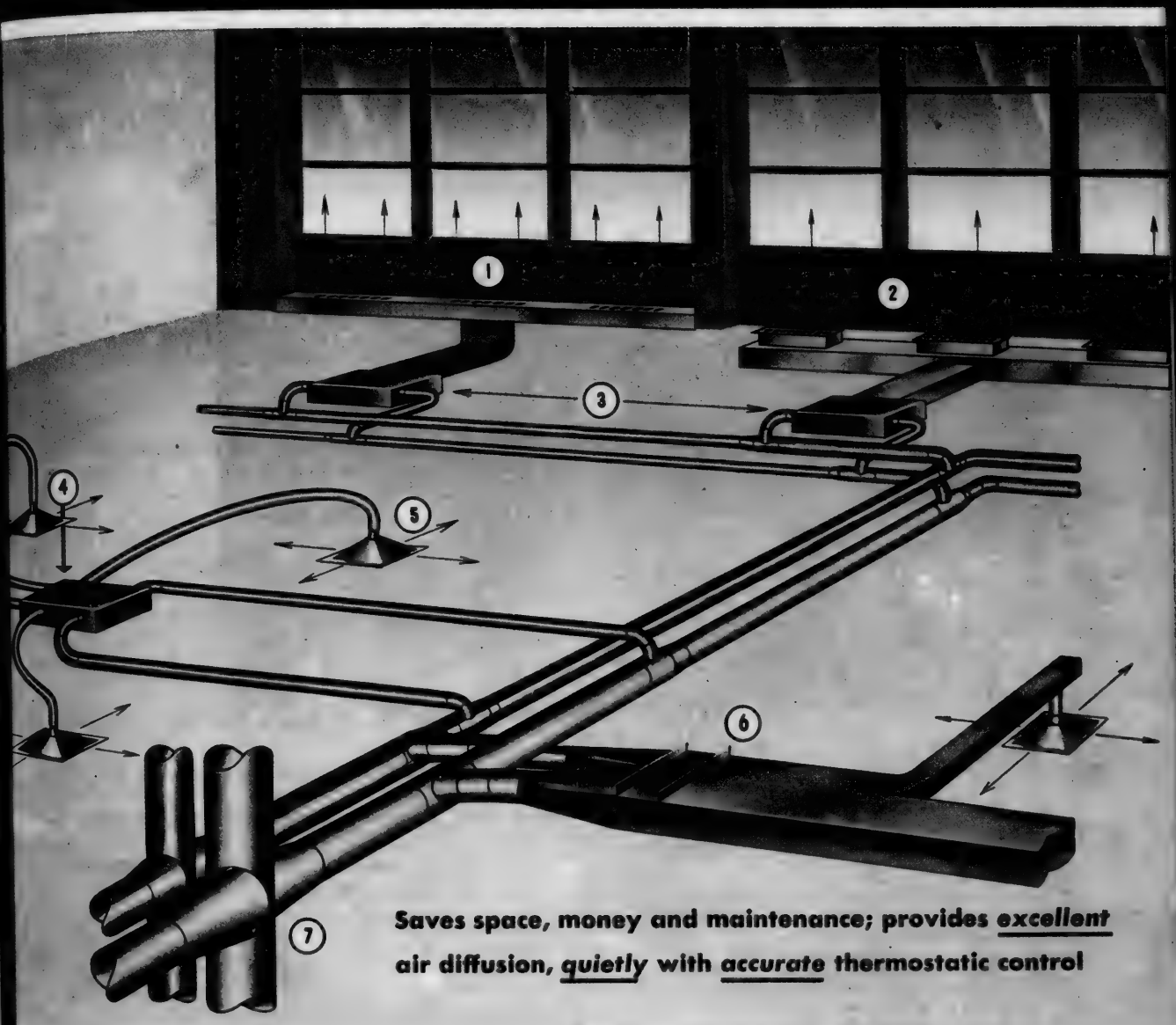
EFFICIENT COOLING SYSTEM—The improved ventilating system used in these motors directs a large volume of air through the motor to effectively reduce temperatures and add to motor life. Cross section above indicates direction of air flow.

QUICK BREAK SWITCH—The starting winding and capacitor are disconnected from the line by this Wagner Switch—test-proved to make more than a million makes and breaks . . . the equivalent of two starts per hour for 50 years.

MYLAR* INSULATION — Mylar-paper laminated slot insulation gives top protection against moisture, adds thermal stability, to give more application versatility and longer life when unexpected overloads occur.

*DuPont Trademark

The New Anemostat "FLEXECONOMY" System for flexible, economical air conditioning



Saves space, money and maintenance; provides *excellent* air diffusion, *quietly* with *accurate* thermostatic control

1. The New Anemostat Diffus-A-Curb — A high induction diffuser (4" high x 6" wide) of rugged stainless steel construction. Provides excellent air diffusion throughout 20 foot exterior zone spaces during both cooling and heating seasons.

or

2. The New Anemostat Stainless Steel Diffus-A-Plate — Diffusion characteristics and performance same as Diffus-A-Curb. Rugged construction to withstand heavy traffic. Provides more effective rentable area. High velocity air streams minimize dirt accumulation in duct.

3. Anemostat Constant Volume High Velocity Units — Automatically controlled by thermostats in the occupied spaces.

4. Anemostat Octopus High Velocity Units—Available for interior spaces where individual controls are required.

5. Anemostat Air Diffusers—Available in any type for high velocity units — square, round, rectangular or perforated plate — to match special or standard type ceilings. Diffusers are available to suit architect's specification.

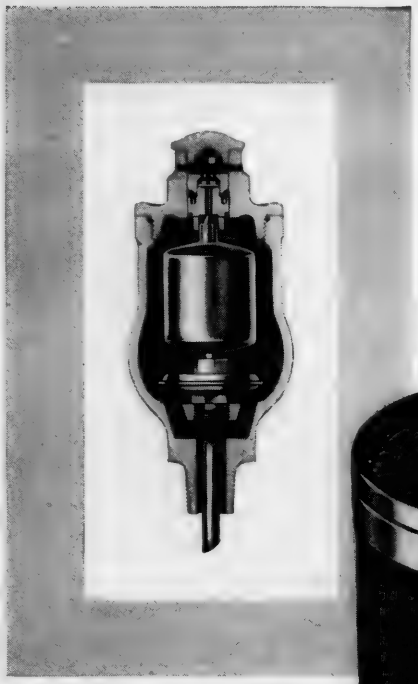
6. New Anemostat Standardized Constant Volume Turbulators — Provide zone controls for spaces up to 7000 square feet in area. Accurately maintain temperature and air volume in the space at pre-determined ratings. Controlled by a thermostat in the zone or in return air duct from zone.

7. High Velocity—High Temperature Differential Ducts (Up to 6000 ft. per minute velocity—up to 30°F differential) — One set of ducts serves both interior and exterior zones. Sized for one solar load because cooling effect is shifted automatically by Anemostat High Velocity Units as sun effect moves from east to west. Duct sizes and duct spaces are reduced by capitalizing on probability factors and modern automatic controls.

ANEMOSTAT®

ANEMOSTAT CORPORATION OF AMERICA

10 East 39th Street, New York 16, N. Y.



A well placed air vent can work a heating miracle!

No. 5 Rapid Vent. Float and thermostatic construction. Designed for use at the end of steam mains, tops of risers and other similar locations on vapor and one pipe vacuum systems where the maximum venting requirement does not exceed one cubic foot per minute at 5 psi.

No. 6 Quick Vent. Thermostatic only. Designed for installation at high points in the piping where there is not sufficient room for the No. 5 Vent or where a float is not needed. Same venting capacity as No. 5.

In a Wilmette Illinois Building, an outwardly well-engineered vacuum system had been a headache for years. Then, last winter, along came a heating man who quickly sized up the situation and said with real conviction: "Put a Marsh No. 5 Vent right there!"

That did it! One inexpensive vent cleaned up a spotty, erratic condition, that a number of expensive alterations had failed to touch.

Unusual? Not in the least: over the years we have seen a lot of wonders worked by installing the right kind of Marsh air vent in the right spot. A number of these dependable vents are illustrated here . . . products that express an unrivaled accumulation of knowledge in dealing with air venting problems.

Marsh air vents are fully covered by the Marsh Heating Specialty Catalog along with Marsh Traps and Valves. Your local Marsh man will be glad to work with you in applying Marsh Vents effectively.

No. 50 Air Vent. Float only. Designed to remove air and gases automatically from hot or cold water tanks, coils or piping, liquid pump systems or similar applications where it is necessary to vent air rapidly. Maximum working pressure, 125 psi.

No. 55 Air Vent. Float and thermostatic construction. Is capable of expelling large volumes of air without passage of water or steam and is designed for use on steam pressure vessels or systems. Maximum working pressure, 125 psi.

No. 7 Air Eliminator. Float and thermostatic construction. Expecially suitable for installation at the ends of steam mains, return piping and tops of risers where it is necessary to expel a large volume of air from the system. Suitable for working pressures up to 15 psi.

MARSH HEATING EQUIPMENT CO.

Sales Affilate of Jas. P. Marsh Corporation

Dept. U, Skokie, Ill.

Marsh Instrument & Valve Co. (Canada) Ltd., 8407 103rd Street, Edmonton, Alberta, Canada

MARSH

Quality Heating Specialties since 1865

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14th International Heating and Air Conditioning Exposition
PHILADELPHIA
Jan. 26-29, 1959

LENNOX INDUSTRIAL HEATERS

...DEVELOPED ...TESTED

in the finest Lennox tradition of superior engineering

From the Lennox Product Development Laboratories come the most thoroughly tested industrial heaters on the market. Modern methods of heat transfer and combustion testing develop heaters adaptable to any application—for heating alone, heating-cooling, ventilating or make-up air requirements. All of this is a part of the continuing Lennox program of technical research.

Specify "Lennox or approved equal" and you'll be sure of the best engineered, highest quality equipment in the heating and ventilating field. Send today, for your complete file of Lennox Industrial Heater specifications and data.

Wind-tunnel testing in the Lennox Product Development Research Laboratories — to accurately measure CFM capacity — is but one of dozens of factory tests made on every Lennox Industrial Heater.

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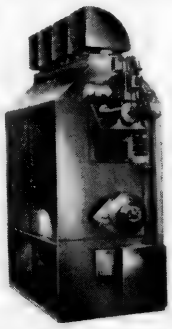
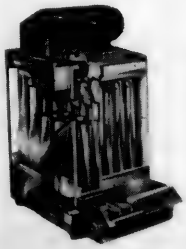


"AT" SERIES HEATERS
400,000 to 2,000,000 Btuh
Oil, gas or combination fuel



GAS DUCT HEATERS
120,000 to 420,000 Btuh
Economical, compact, rugged

LENNOX Industries Inc.

INDUSTRIAL DIVISION • 1701 East Euclid • Des Moines, Iowa

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Please send me — without obligation — complete specifications and engineering data on Lennox Industrial heaters.

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Distinctive SLOT TYPE Diffusers

Look around . . . you'll see STRIPLINE by AGITAIR everywhere. And no wonder. STRIPLINE combines the best features of both slots and efficient air diffusers to provide equalized air flow throughout its entire length.

Slender, inconspicuous, practical and versatile . . . STRIPLINE slot diffusers can be located in walls, ceilings, coves, moulds, window reveals, stools... yes anywhere to suit interior design.

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high velocity units • punkah louvers
air diffusers • filters • exhausters

Sold exclusively by representatives for:

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Write for Complete Stripline Catalog

Type H Stripline shown in above installation

"This **REVERE COLOR-CODING**
not only saves money and mistakes
it's also my guarantee of a
quality product made in America,"

says J. H. Spitzley, President
R. L. SPITZLEY HEATING COMPANY,
Detroit, Michigan

Joseph H. Spitzley, past President of the Mechanical Contractors Association of America, tells us that copper water tube is easier to handle and work with, is ideally suited to prefabrication of assemblies in the shop and at the site, with the result that it costs less to install.

"We have been using Revere Color-Coded Copper Water Tube for some time now and believe me it has paid off. Mistakes in sizes are virtually eliminated while many minutes are saved during a day because the different types and sizes can be noted at a glance. Our men find it better to work with on the job, too.

"And, an important added value right now is the fact that, in addition to the type and size, Revere Color-Coded Tube also is stamped, 'Made in U.S.A.' That not only guarantees us that we are *buying* a quality product but it shows our customers that they are *getting* a quality product, made by American labor in America."

So that you can spot the type and size of tube being handled, even where the light is poor, the color bars on Revere Color-Coded Tube run the full length of the 20-foot, straight-length tubes, and show tube sizes and types about every 12". Cartons, in which coiled tubing is shipped, are colored according to contents.

Save time, money and mistakes. Order Revere Color-Coded Copper Water Tube from the Revere Distributor in your area.

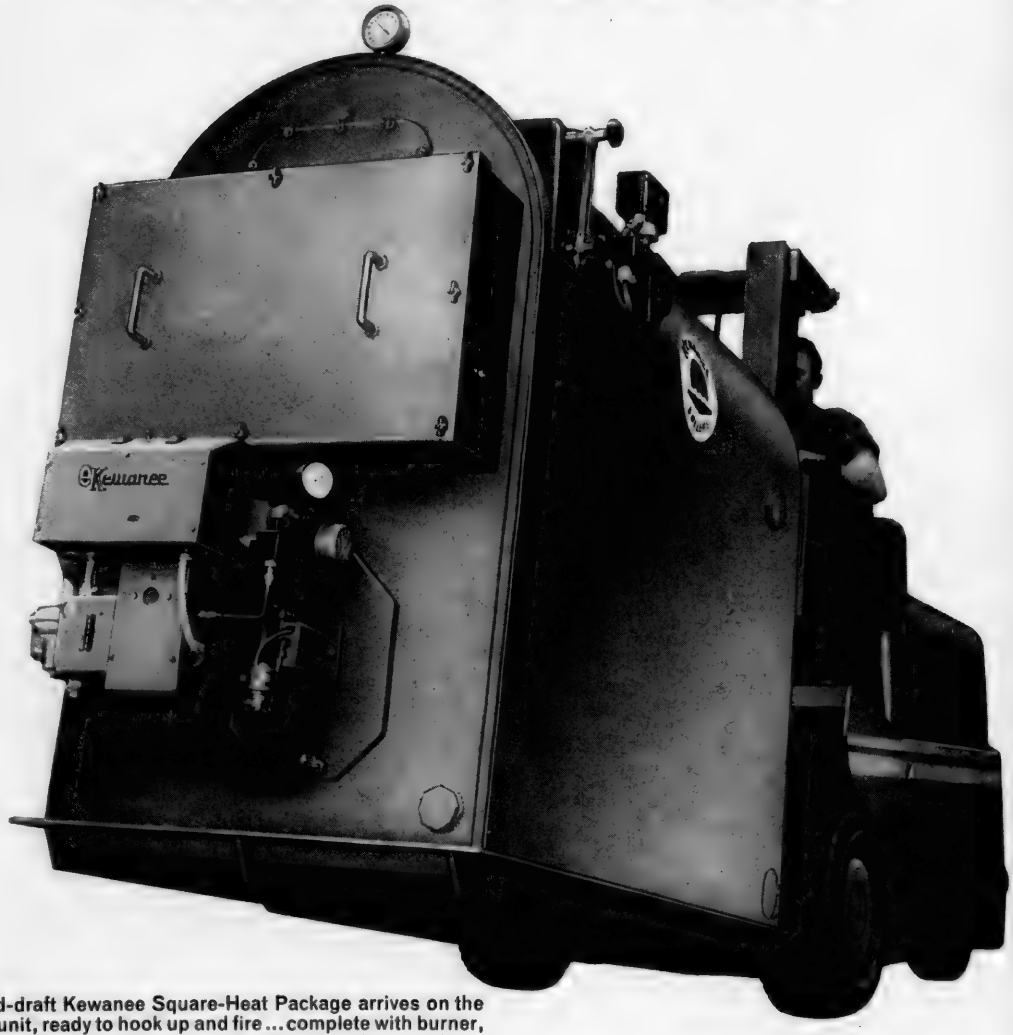
COPPER • BRASS • REVERE • ALUMINUM

MADE IN U.S.A. TO THE STANDARDS OF AMERICAN INDUSTRY

REVERE COPPER AND BRASS INCORPORATED
Founded by Paul Revere in 1801
230 Park Avenue, New York 17, N. Y.

Mills: Rome, N.Y.; Baltimore, Md.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Brooklyn, N.Y.; Newport, Ark.; Ft. Calhoun, Neb. Sales Office in Principal Cities, Distributors Everywhere.

NOW...FORCED-DRAFT FIREBOX PACKAGES



Forced-draft Kewanee Square-Heat Package arrives on the job as a unit, ready to hook up and fire...complete with burner, pre-wired control panel, pre-cast refractory chamber and skids. It requires no crating...no job-site insulating.

KEWANEE® SQUARE-HEAT GAS-OIL UNITS

for 15 lb. steam or 30 lb. water, 216,000 to 1,800,000 Btuh

For the first time, Kewanee offers a fire-box package boiler! The new Square-Heat Packages are forced-draft, requiring only a stub vent—no high stack. Kewanee's new combination gas-oil burner fires natural, mixed or L.P. gas . . . No. 1 or 2 fuel oil. One switch changes fuels . . . automatic changeover is available. An exclusive air distribution system pre-mixes gas and air before it enters the combustion chamber, for smoother and more efficient firing.

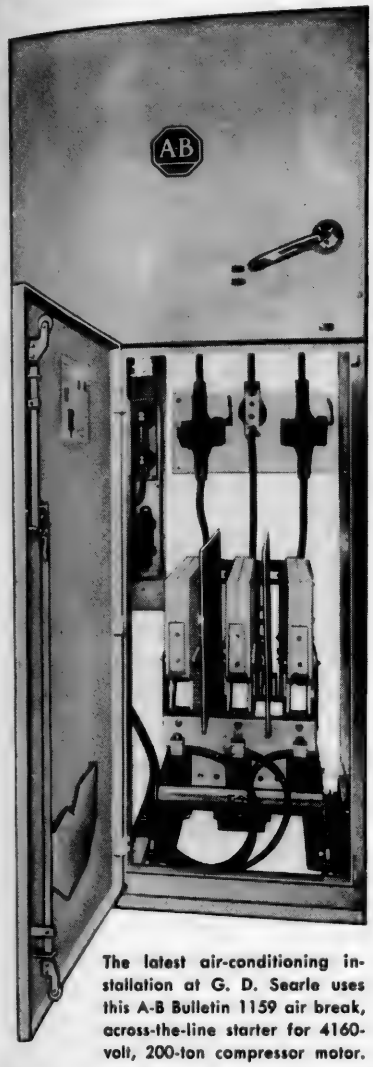
Along with the new burner is a new pressure-tight front flue cover dogged down by easily removed wing nuts . . . and a new, standard-equipment, wrap-around insulated jacket of heavy-gauge steel. Retained in the new units are Square-Heat's compact design, large firebox, widely spaced 3" fire tubes, large disengaging area and ample steam space.

For complete facts see your Kewanee Man or write: AMERICAN-STANDARD*, KEWANEE BOILER DIVISION, 117 Franklin Street, Kewanee, Illinois.

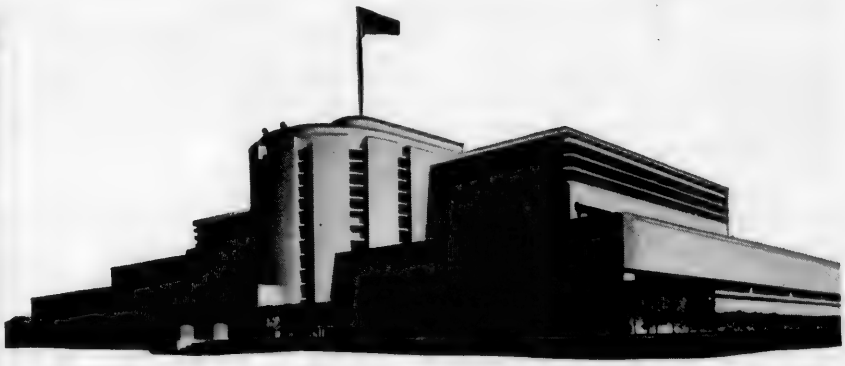
See this new Square-Heat unit among the display of Kewanee forced-draft packages at Booth 63-65-67, ASHAE Show, Philadelphia, January 26-29, 1959.

*American-Standard and Standard ® are trademarks of American Radiator & Standard Sanitary Corporation.

AMERICAN-Standard
KEWANEE BOILER DIVISION



The latest air-conditioning installation at G. D. Searle uses this A-B Bulletin 1159 air break, across-the-line starter for 4160-volt, 200-ton compressor motor.



G. D. Searle & Co. selects

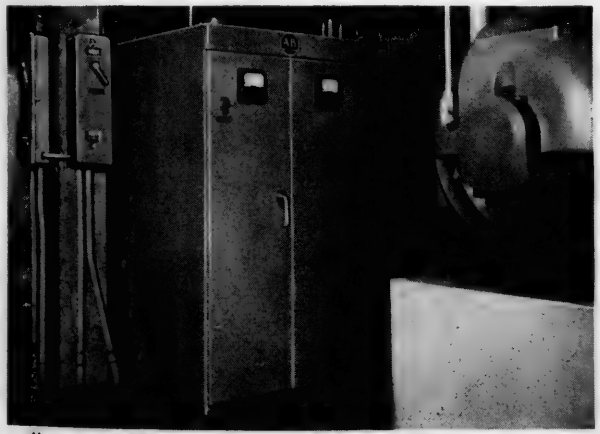
ALLEN-BRADLEY AIR BREAK HIGH VOLTAGE STARTERS

for its air-conditioning system

Here's the *most modern*—and *most rugged*—high voltage starter built today! Its simple solenoid, air break contactor—with only ONE moving part—virtually guarantees long life and trouble free operation. This same basic design has been used on all Allen-Bradley low voltage starters . . . and is the outstanding reason for their world-wide success and popularity.

Also, using the double break, silver alloy contacts—a standard feature on *all* A-B motor control—service inspection two or three times a year is all that is necessary. All A-B high voltage starters have permanently accurate thermal overload relays to protect against motor burnouts, and all are equipped with current limiting fuses.

Allen-Bradley high voltage starters are available in a complete line for all types of service—including reversing and plugging—in ratings up to 1500 hp, 2300 v; 2500 hp, 4600 v. For complete information, send for Publication 6080, today.



Here are two Allen-Bradley Bulletin 952 reduced voltage auto-transformer starters operating 4160-volt, 200-ton compressor motors. These starters, using oil-immersed contactors, were put into service many years ago prior to the introduction of Allen-Bradley's new air break contactor. Oil-immersed starters require more attention but provide good service where frequent starting is not required.

ALLEN-BRADLEY

QUALITY

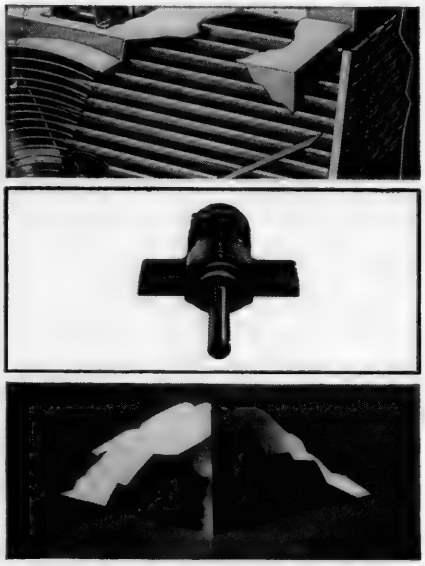
MOTOR CONTROL

Allen-Bradley Co.
1330 S. Second St., Milwaukee 4, Wis.
In Canada:
Allen-Bradley Canada Ltd., Galt, Ont.

SO HALSTEAD & MITCHELL ENGINEERS SAID . . .

FOR LIKE-NEW PERFORMANCE YEAR AFTER YEAR— H&M COOLING TOWERS

Halstead & Mitchell Cooling Towers give rated performance even after years of operation



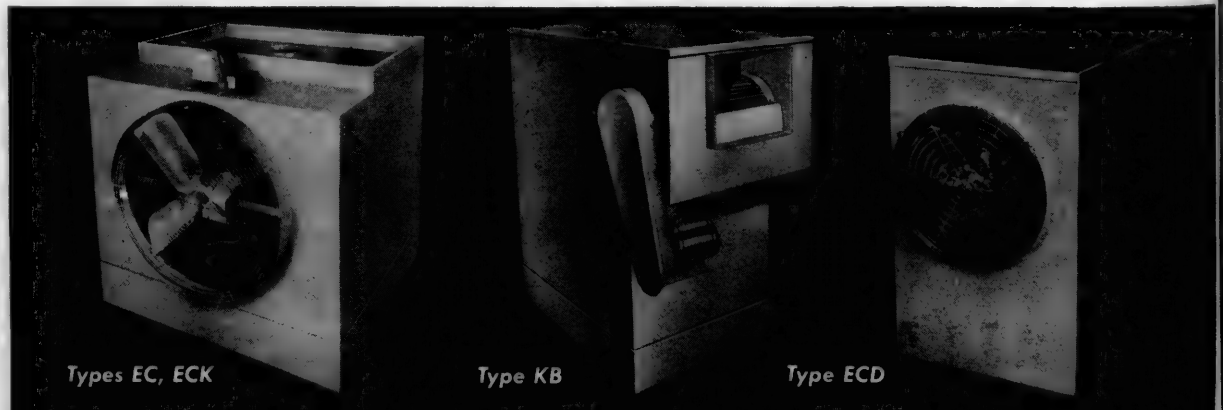
Special pressure creosoting of the wood fill prevents formation of fungus and algae which can build up and restrict the tower air flow, reducing system capacity. Only Halstead & Mitchell Cooling Towers carry a 20-Year Guarantee against failure due to fungus attack or rotting.

Sealed fan bearings are permanently lubricated, require no maintenance.

Tower housings are completely protected against corrosion by separate coatings of Vinsynite, Vinyl zinc chromate, and chlorinated rubber applied *after assembly*. Every edge, every corner is sealed against rust on all H&M Cooling Towers.

H&M Cooling Towers are available in propeller fan, centrifugal fan, belt drive, direct drive, and take-apart models. Capacities of 2 through 125 tons. For complete information contact your local distributor, or write to Halstead & Mitchell, Bessemer Bldg., Pittsburgh 22, Pa.

HM Halstead & Mitchell



COOLING TOWERS · WATER-COOLED CONDENSERS · AIR-COOLED CONDENSERS · FINNED COILS

JENKINS PRACTICAL PIPING LAYOUTS

82

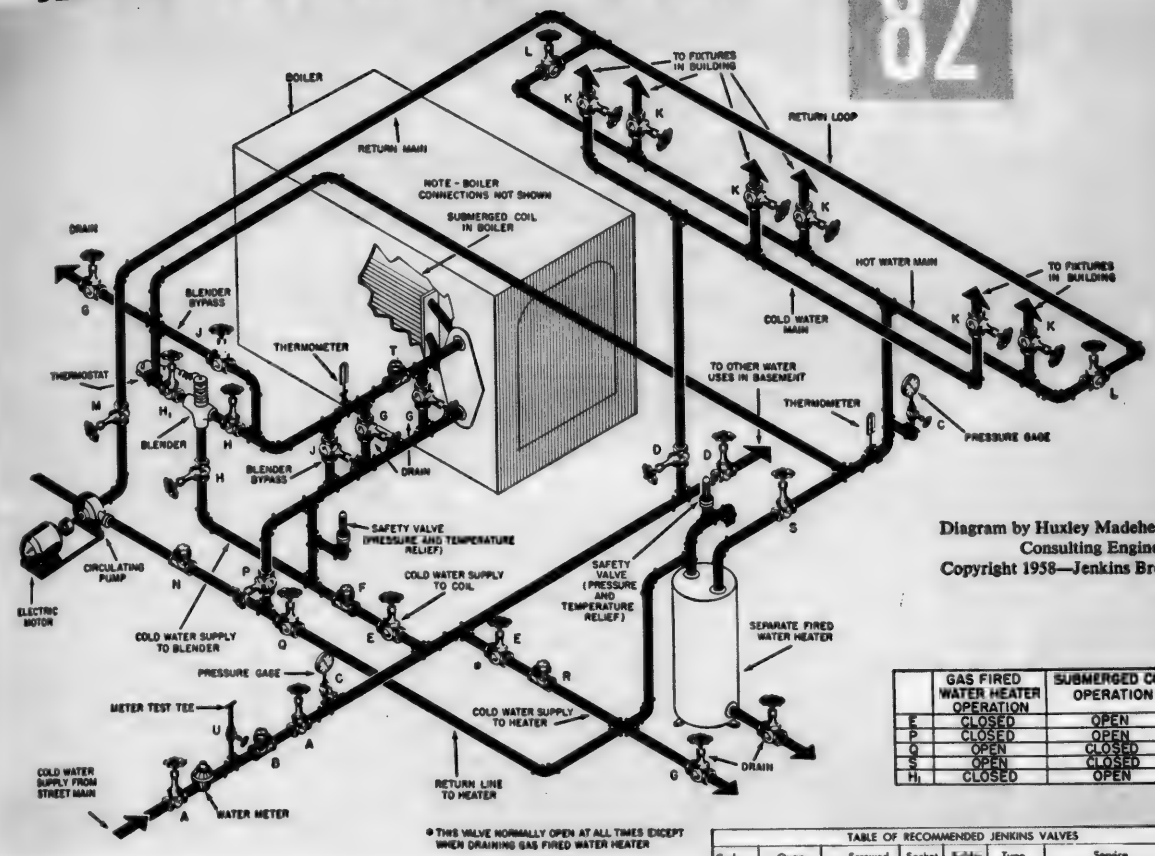


Diagram by Huxley Madeheim
Consulting Engineer
Copyright 1958—Jenkins Bros.

	GAS FIRED WATER HEATER OPERATION	SUBMERGED COIL OPERATION
E	CLOSED	OPEN
P	CLOSED	OPEN
Q	OPEN	CLOSED
S	OPEN	CLOSED
H_1	CLOSED	OPEN

* THIS VALVE NORMALLY OPEN AT ALL TIMES EXCEPT WHEN DRAINING GAS FIRED WATER HEATER

TABLE OF RECOMMENDED JENKINS VALVES

Code	Quan.	Screwed	Socket	Solder	Type	Service
A	2	Fig. 47-U	1273	1242	Gate	Shutoff Cold Water Supply
B	1	Fig. 92-A	1272	1222	Check	Prevent Backflow to Main
C	2	Fig. 743-G			Needle	Control Pressure Gage
D	2	Fig. 47-U	1273	1242	Gate	Shutoff Cold Water Dist. System
E	2	Fig. 106-A	1270	1200	Globe	Control Cold Water Supply to Heaters
F	1	Fig. 92-A	1272	1222	Check	Prevent Backflow from Coil to Main
G	5	Fig. 106-A	1270	1200	Globe	Control Drains
H	3	Fig. 47-U	1273	1242	Gate	Shutoff Blender
J	2	Fig. 106-A	1270	1200	Globe	Control By-pass about Blender
K	6*	Fig. 106-A	1270	1200	Globe	Control Water Supply to Individual Fixtures
L	2	Fig. 106-A	1270	1200	Globe	Control Flow through Return Loop
M	1	Fig. 47-U	1273	1242	Gate	Shutoff Suction Circulating Pump
N	1	Fig. 92-A	1272	1222	Check	Prevent Backflow through Circulating Pump
P	1	Fig. 106-A	1270	1200	Globe	Control Flow Return Water to Coil
Q	1	Fig. 106-A	1270	1200	Globe	Control Flow Return Water to Heater
R	1	Fig. 92-A	1272	1222	Check	Prevent Backflow from Heater to Main
S	1	Fig. 47-U	1273	1242	Gate	Shutoff Hot Water Supply from Heater
T	1	Fig. 92-A	1272	1222	Check	Prevent Backflow through Coil
U	1	Fig. 106-A	1270	1200	Globe	Control Meter Test Line

*Dependent on quantity of fixtures.

How to plan piping connections for

A HOT WATER SUPPLY SYSTEM

using both Submerged Coil and Separate Water Heater

Continuous hot water for general use is a requirement of many small office buildings, taxpayers, stores, and sections of multi-story buildings. In this layout, two conventional methods of supplying hot water are shown in combination, assuring continuous supply throughout the year with a minimum investment and maximum convenience.

A submerged coil utilizes as a heat source the main boiler whose primary function is to furnish heat for the building. A separately fired heater is employed to provide continuous hot water should the main boiler be shut down during the non-heating season or for maintenance. Connections to both units of hot water generating equipment are arranged so that change-over involves only the operation of valves. The distribution system shown incorporates a circulating pump and return loop, to guarantee hot water at the fixtures at all times.

A Blender valve with the submerged coil permits tempering water to desired temperature, and is equipped with bypasses to permit blender maintenance and emergency repairs without a shutdown. The separately fired heater has its own thermostatic control, so does not require a blender valve.

Safety valves protect both hot water generators. These valves are installed without shutoff to prevent damage and especially damage from possible steam generation in the separately fired heater. Also, it is recommended that cold water admission valve "E" to this heater be left open at all times, except when draining heater, to prevent formation of a vacuum or burning of heater if evaporated dry.

Bronze valves are used throughout because they give best service with most conditions of city water. All gate valves are of the traveling spindle type, which indicate position of wedge.

Jenkins Fig. 106-A screwed end bronze globe valve, (or its equivalent Fig. 1270 with socket ends, or Fig. 1270 with solder ends), is used extensively throughout this piping layout. Its renewable composition disc assures drop-tight closure, and it incorporates many other design and construction features which mean economical maintenance and long, trouble-free life.

To assure efficiency when planning a major piping installation, consult with accredited piping engineers and contractors, and select valves from the Jenkins Catalog.

FREE enlargement of this layout No. 82 sent on request to Jenkins Bros., 100 Park Ave., New York 17.

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES
SINCE 1864
Jenkins Bros.
Sold through Leading Distributors Everywhere

KRAMER

UNICON for UNLIMITED TONNAGE

Kramer Unicon has brought a new era into the industry. With more than 20 years of unique practical experience and know-how in dry condensing, Kramer again offers new avenues of opportunity to the air conditioning and refrigeration industry.

Unicon now has no capacity limit. Standard Unicon systems up to 540 tons are now cataloged for the first time.

Unicons for heat pump applications are now also available with no horsepower limitations.

Kramer engineering and design has proven that the Unicon can move large volumes of air with extreme quietness.

Unicon has long proven by actual experience that it is free from fouling or corrosion and requires practically no maintenance.

The total operating weight per ton for Unicon is very low, resulting in minimum platform and reinforcement requirements.

Unicon space requirements are surprisingly small; a 300 ton system requires only 15′ x 14′ floor space and is 12′ high.

WRITE FOR BULLETIN U-391

KRAMER TRENTON CO. • Trenton 5, N.J.

44 YEARS OF CONTINUOUS ACHIEVEMENT IN HEAT TRANSFER

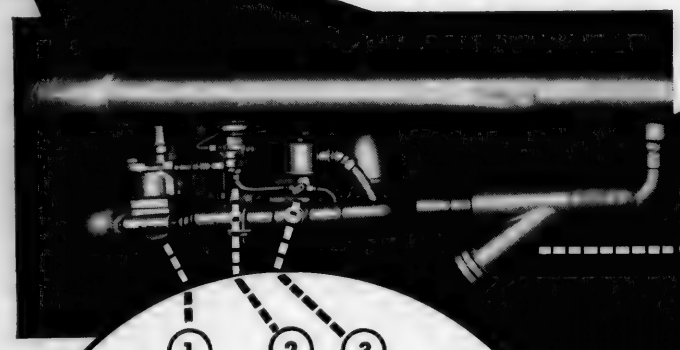
WHETHER POWERED BY **GAS** OR **ELECTRIC**

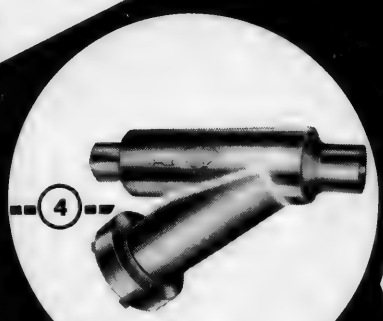
specify

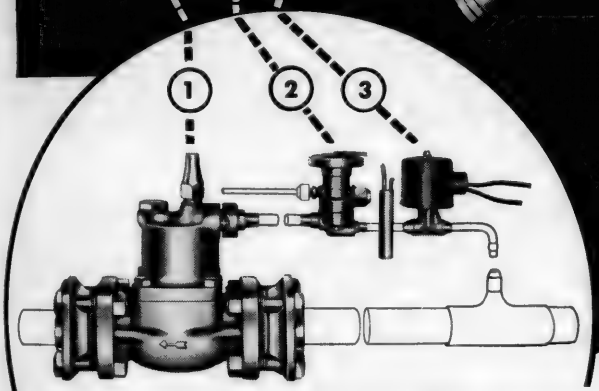
EFFICIENT, POSITIVE ACTION

ALCO

REFRIGERANT CONTROLS



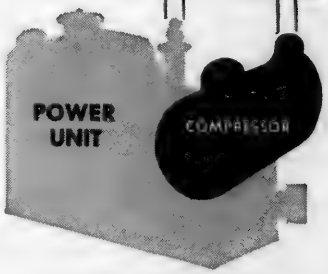




1 ALCO P.O. VALVES—designed and engineered specifically for wide load applications—particularly recommended for refrigeration systems having compressor capacity reduction.

2 ALCO'S PILOT OPERATED THERMO® EXPANSION VALVES give a positive control to 15% of nominal capacity with minimum superheat.

3 ALCO SOLENOID PILOT STOP VALVE insures positive liquid "Shut off".

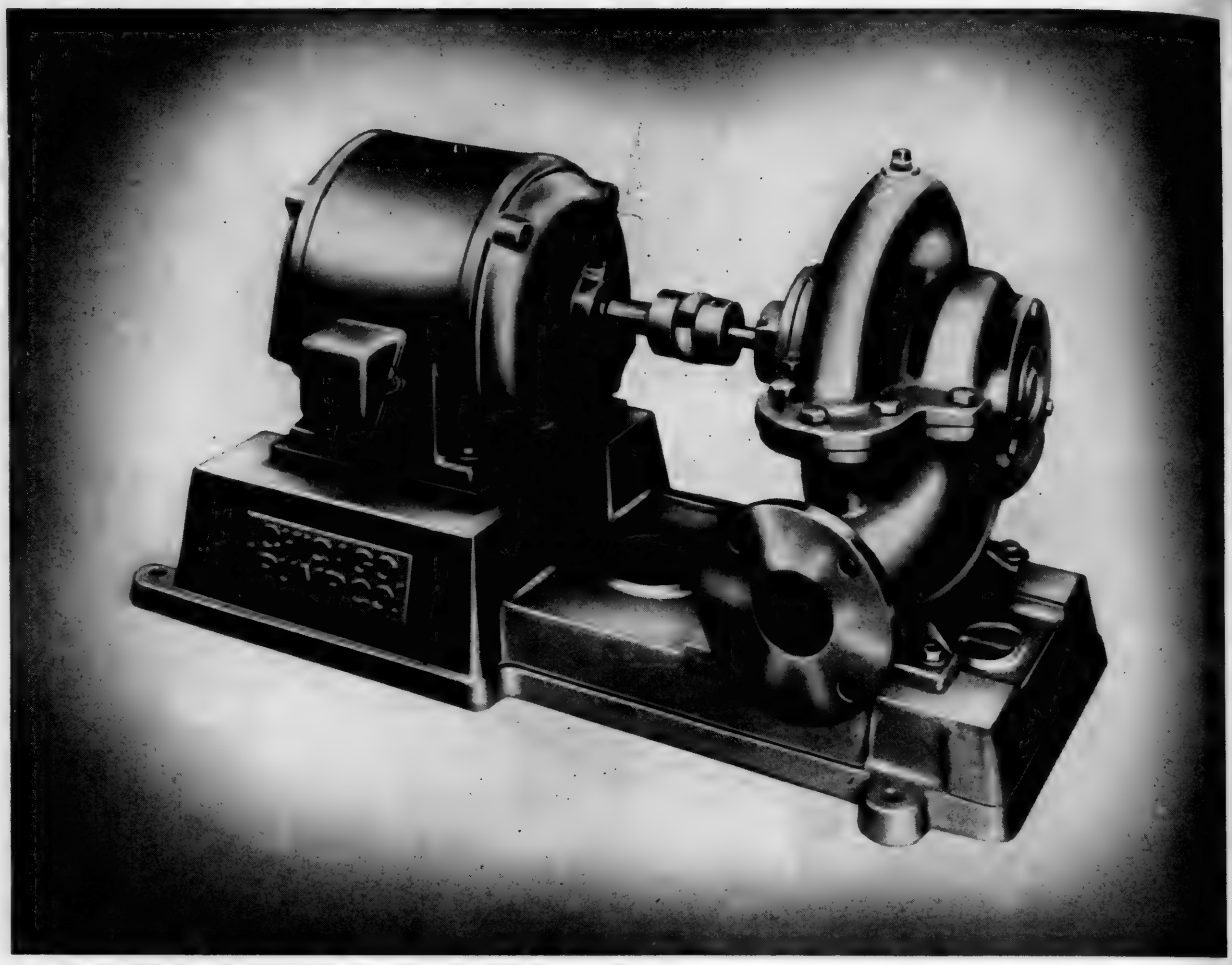


Use and specify ALCO—the one complete line of REFRIGERANT CONTROLS...engineered for efficient trouble free performance.

7988

- *BUY SECURITY*
- *BUY QUALITY*
- *BUY ALCO*

The one complete line of refrigerant controls: Thermostatic Expansion Valves • Refrigerant Distributors Solenoid Valves • Suction Line Regulators • Flooded Evaporator Controls and Reversing Valves



"from Chicago"

A NEW LINE OF HORIZONTALLY SPLIT-CASE CENTRIFUGAL PUMPS

Quiet Operating . . . Low Cost . . . Efficient, Hydraulically Balanced

FOR

AIR CONDITIONING
Air Washing
Chilled Water Circulating
Condenser Water Service
Cooling Tower Circulating

BOOSTER
Increasing City Water Pressure

HEATING
Boiler Feed
Condensation
Hot Water Circulating

PNEUMATIC WATER SYSTEMS
Automatically maintaining the required pressure in closed tanks to instantaneously deliver water to all fixtures.

REFRIGERATION
Water Circulating

SNOW MELTING
Ethelene Glycol Circulating

Chicago Pump Company announces a new line of Single Stage, Horizontally Split-Case Centrifugal Pumps—known as Type "S".

These pumps feature heavy shafts . . . short span between bearings . . . minimum space requirements . . . excellent operating efficiencies . . . desirable capacity-head characteristics . . . pre-lubricated ball bearings . . . mechanical seals . . . easily removable rotating assembly . . . suction and discharge on same lower casing centerline . . . rugged construction throughout to insure years of trouble-free service.

Bulletins and engineering data are available to Architects and Engineers from Chicago Pump Company or its Distributors located in most principal cities.

fmc
FOOD MACHINERY AND CHEMICAL CORPORATION

Putting Ideas to Work

FOOD MACHINERY AND CHEMICAL CORPORATION

Chicago Pump Company

622 DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

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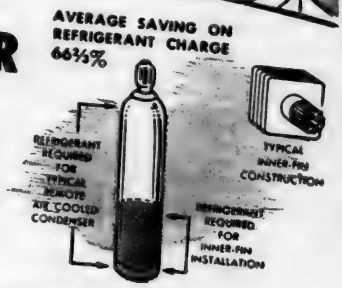
What's NEW in Remote Air Cooled Condensers?

This

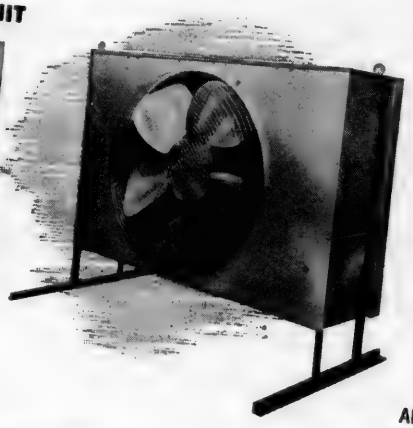
A REMOTE AIR COOLED CONDENSER THAT REQUIRES UP TO 1/3 OF THE REFRIGERANT CHARGE USED BY COMPETITIVE MODELS


AVERAGE SAVING ON REFRIGERANT CHARGE 66⅔%
REFRIGERANT REQUIRED FOR TYPICAL REMOTE AIR COOLED CONDENSER
TYPICAL INNER-FIN CONSTRUCTION
REFRIGERANT REQUIRED FOR INNER-FIN INSTALLATION

A RECENT 300 TON JOB SHOWED SAVINGS OF 1800 LBS. OF REFRIGERANT THROUGH USE OF THESE UNITS.

Yes, the Dunham-Bush 'BC' Remote Air Cooled Condensers with famous Inner-Fin construction mean savings of 67% in refrigerant charge. Additionally, they mean smaller receivers and minimum loss if the system charge is lost. In these expertly planned units, the exclusive Inner-Fin construction diminishes the internal volume of the coil while increasing the heat transfer coefficient. And higher heat transfer factors permit design of more compact units, saving valuable space in installation.

AS MUCH AS 53.5 TON CAPACITY IN ONE UNIT



The Dunham-Bush line of 'BC' Remote Air Cooled Condensers includes models in 13 sizes with capacities ranging from 2.2 tons to 53.5 tons, making possible use of a single unit for practically any job!

FOR ALL 'ROUND PROTECTION

Plastic vinyl paint is applied to all ferrous parts of unit casing and structure in three stages:

PRIMER—a polyvinyl plastic combined with zinc chromate.

INTERMEDIATE—a vinyl resin with high lead content.

FINISH—hard grey, all weather resistant plastic vinyl.

All interior surfaces of the unit casing are given an extra finish coat of plastic vinyl.

AND FOR MAINTAINING SATISFACTORY HEAD PRESSURES

at all ambients, Dunham-Bush engineers offer the 'PS' Pressure Stabilizer.

'PS' units can be mounted indoors near the compressor, facilitating the making of necessary adjustments. They are thoroughly factory tested and assembled, and require connection only to the refrigerant liquid and discharge lines. No extra piping or special loops required. Regulating valve gives smooth pressure control and eliminates wide pressure fluctuations inherent in other head control systems.

The name Dunham-Bush is synonymous with efficient, satisfactory service for all types of pressure and temperature conditions. For technical assistance, our engineering staff is at your service. For more information, contact us.

Dunham-Bush, Inc.

WEST HARTFORD 10 • CONNECTICUT • U. S. A.

DUNHAM-BUSH

WEST HARTFORD, CONNECTICUT • MICHIGAN CITY, INDIANA • MARSHALLTOWN, IOWA • RIVERSIDE, CALIFORNIA • UTICA, NEW YORK

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WHEELS

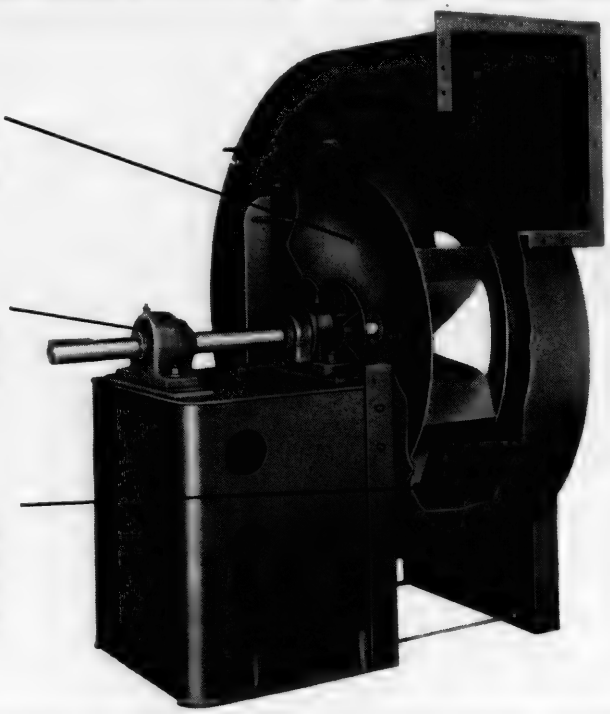
Welded steel construction. One-piece, cone-shaped rims and hubplates, standard or extra-heavy.

BEARINGS

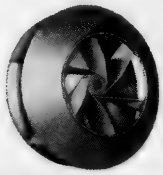
Heavy-duty, self-aligning ball or tapered roller bearings for quiet operation, dependability, long life.

HOUSINGS

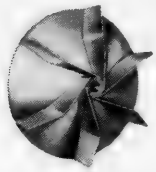
Heavy welded sheet steel or plate, adjustable discharge in sizes thru 37" inlet. Fixed discharge on larger sizes. Externally braced for maximum rigidity.



AIR HANDLING
Type AH



MATERIAL HANDLING
Type MH

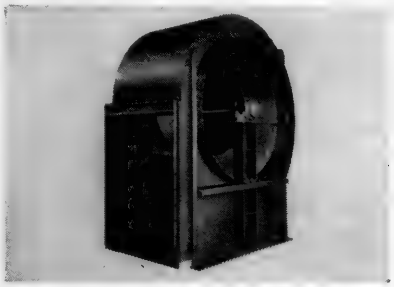


LONG SHAVINGS
Type LS

Handle any one of 3 basic processes with an American Blower Industrial Fan

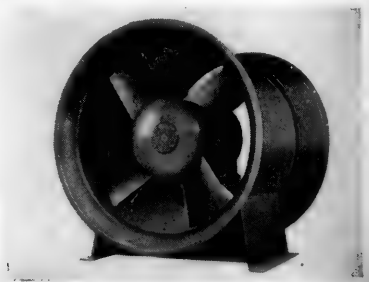
Here's a practical way to solve tough process applications: an American Blower Industrial Fan. It's available with three types of wheels to let you handle air, gases, or air and gases containing material, or long shavings. And there's a wide range of fan arrangements, optional constructions — for severe duties or high-temperature operations — and optional accessories to allow fan modification for individual jobs. Equipment selection and application assistance is available, should you need it, from our 73 engineer-staffed branch offices. A phone call is all it takes to get full product information. American-Standard,* American Blower Division, Detroit 32, Mich. In Canada: Canadian Sirocco products, Windsor, Ontario.

It pays to standardize on American Blower fans for every duty!



HS Fans—direct or V-belt drive, medium-speed operation; nonoverloading.

Sirocco Fans — low speed, quiet operation; move more air per revolution.



Axial Fans— move high volumes in minimum space; flexible installation.

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AMERICAN-Standard
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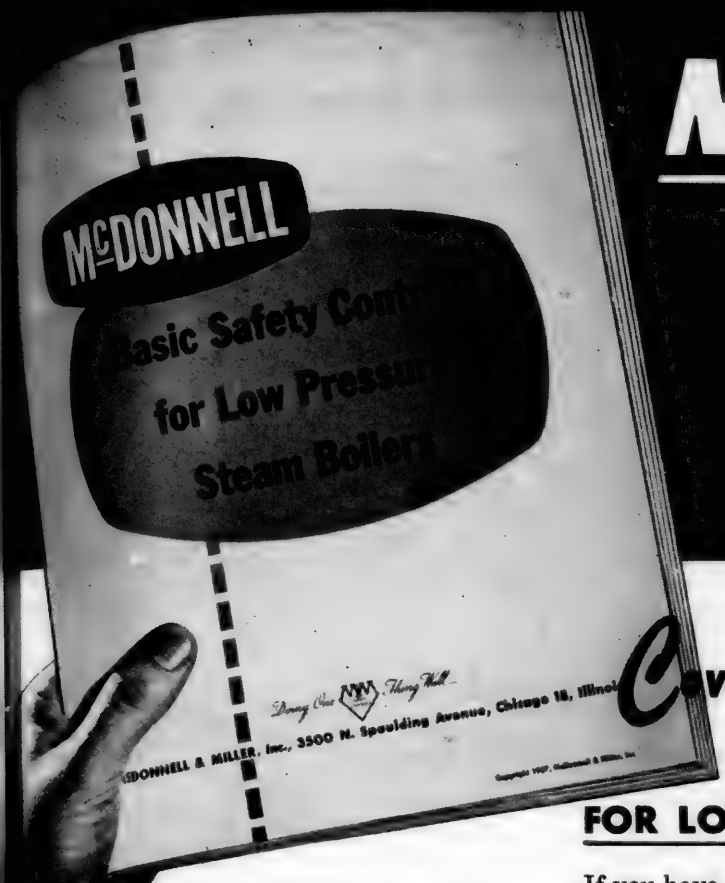

McDONNELL
for Low Pressure
Steam Boilers
Doing One Thing Well
McDONNELL & MILLER, Inc., 3500 N. Spaulding Avenue, Chicago 18, Illinois

NEW BOOK

That can do a job for you!

Covers the WHY and HOW of

BASIC SAFETY CONTROLS

FOR LOW PRESSURE STEAM BOILERS

If you have one of our recent booklets on Safety Controls for Hot Water Boilers, we know you will want this companion to it covering the low pressure steam boilers. It is the answer to the many requests for "a steam book just like the hot water book."

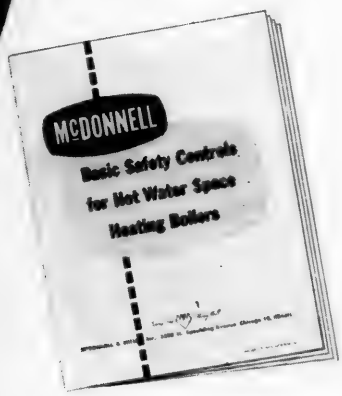
Like its well received predecessor, it deals in brass tacks solely. It tells its story in simple diagrams and equally simple explanation that wastes no words on product description. It sticks to fundamentals and concrete recommendations that answer practically all safety control problems encountered in the low pressure steam boiler field . . . your broadest field.

So well classified and indexed are the facts that whenever a job comes up—however tricky—you can turn right to the most authentic way of handling it: The right product . . . the correct hook-up . . . the proper wiring.

Use the coupon to request your copy, and if by any chance you do not have the earlier "hot water" booklet, request it too.

McDonnell & Miller, Inc., 3500 N. Spaulding Ave., Chicago 18, Ill.

Doing One Thing Well



"Basic Safety Controls for Low Pressure *Steam Boilers*" was inspired by the widely praised booklet, "Basic Safety Controls for *Hot Water Boilers*," illustrated above. If you do not have a copy of the "Hot Water" booklet request it along with the "Steam" booklet. These two companion-pieces can do a real job for you.

Yours for the Asking ➧

Send me your new STEAM Book Bul. L-711 ☐

Send me your new companion HOT WATER Book Bul. P-30B ☐

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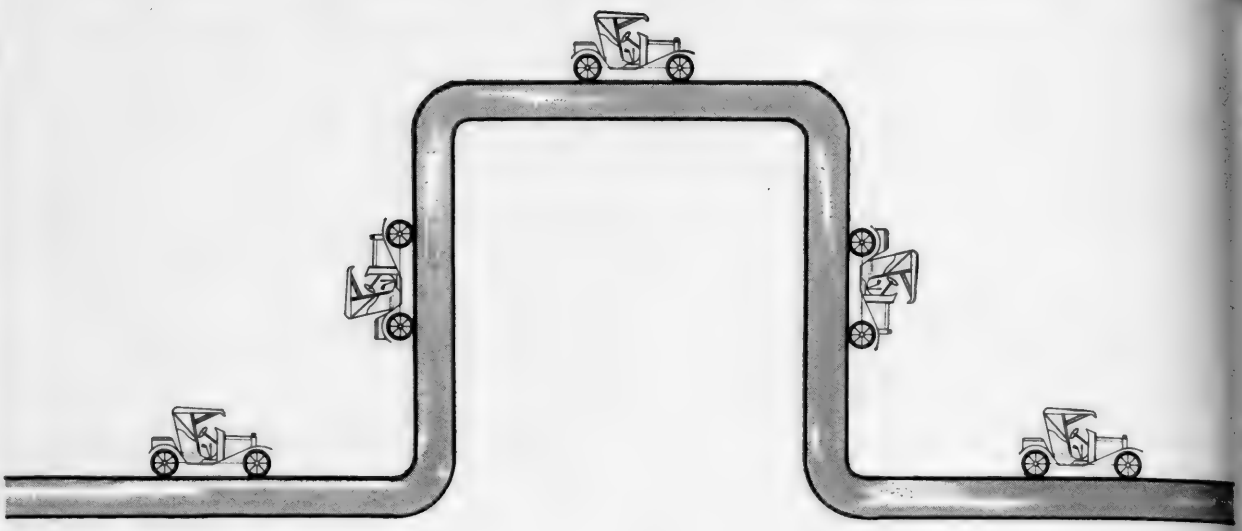
Mail to—McDonnell & Miller, Inc., 3500 N. Spaulding Ave., Chicago 18, Illinois

McDONNELL

Boiler Water Level Controls

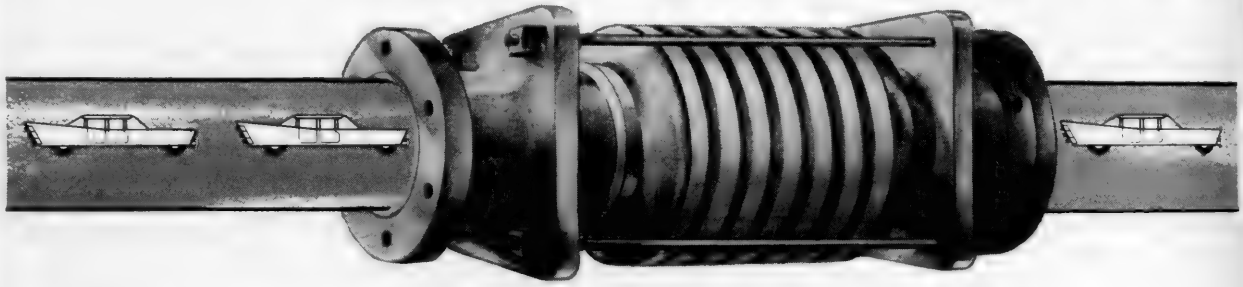


ADSCO CORRUFLEX EXPANSION JOINTS...

...give modern straight line efficiency

Loops and Bends

...are the long way 'round



ADSCO Corruflex Expansion Joints guarantee less heat loss and pressure drop . . . require less valuable space . . . and the cost is 30% to 50% lower . . . as compared to expansion bends or loops.

ADSCO Corruflex Expansion Joints are manufactured either as a standard series or as custom units designed for special applications. Corruflex units absorb axial and lateral movement or angular rotational and all combinations of these motions.

ADSCO Corruflex Expansion Joints are manufactured in most commercial alloys, and are designed for service in all phases of petroleum refining, chemical, power, mechanical, heating, and atomic energy installations.

When space and economy are factors in piping consult ADSCO.

CORRUFLEX EXPANSION JOINTS DESIGNED AND MANUFACTURED BY

ADSCO DIVISION
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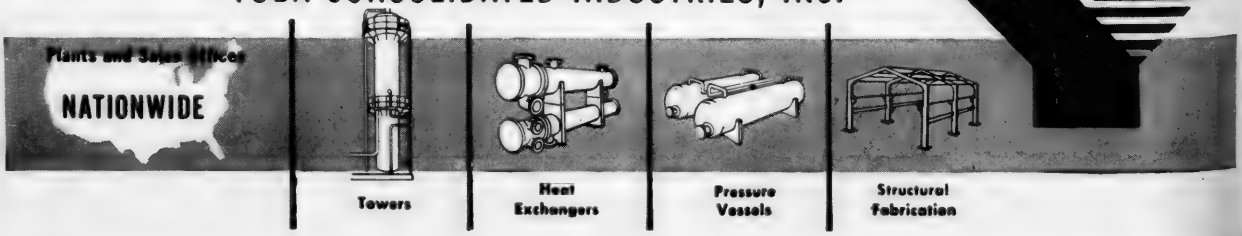
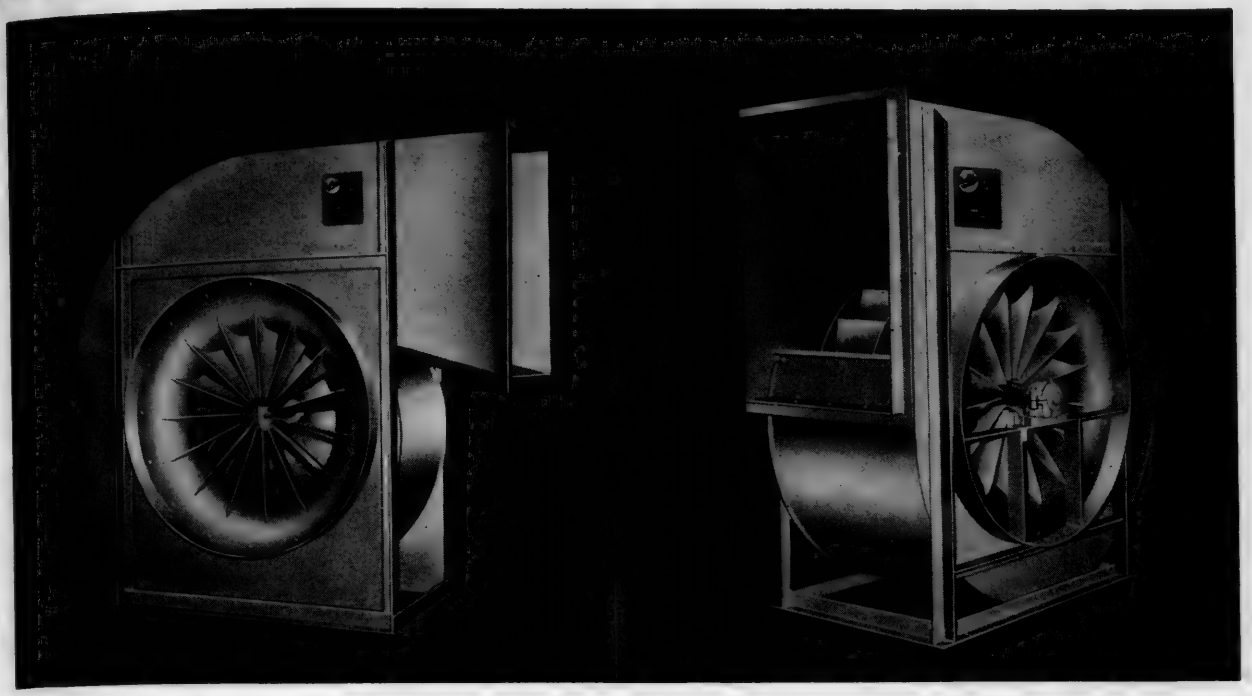
YUBA CONSOLIDATED INDUSTRIES, INC.

YUBA





For Classes III-IV (High Pressures) The "Buffalo" Type "BLH" Fan

For Classes I-II (Moderate Pressures) The "Buffalo" Type "BL" Fan

FOR THE BEST ENGINEERED JOBS, SPECIFY BUFFALO "JOB-SUITED" FANS

For central system applications you don't have to accept a "compromise fan", loosely designed to cover any and all pressure requirements. "Buffalo" builds *two* fans, each engineered to fulfill specific pressure requirements to the highest possible degree. Brief engineering details on these "no compromise" "Buffalo" Fans are given below.

The "Buffalo" Type "BLH" Fan is recognized by engineers and contractors alike for its outstanding performance in Classes III and IV service. The "BLH" maintains an extremely high mechanical efficiency of 86% over a broad operating range. The smooth inlet bell with matching shroud, directional inlet vanes, backward-curved blades and divergent outlet all contribute to quiet operation and minimum turbulence. "Buffalo" engineering features, plus husky construction, add up to an efficient high pressure fan that will deliver long, faithful, maintenance-free service. When you plan a conduit system or other Class III-IV installation, be sure to specify the "BLH". Call in your "Buffalo" representative or write for Bulletin F-200.

The "Buffalo" Type "BL" Fan has gained wide acceptance for peak performance in major Class I and II installations throughout the country. Non-overloading, the "BL" provides quiet, stable, output from free delivery to shutoff. The smoothly-curved inlet bell, with directional guide vanes and matching shroud, assures minimum turbulence. Highest efficiency is attained by the streamlined wheel with backward curved blades, factory tested and balanced to hold vibration to an absolute minimum. The correctly shaped scroll of the wheel-contoured housing further contributes to smooth air flow. For full information on the rugged, reliable "BL" Fan for Class I and II conditions, contact your "Buffalo" engineering representative. Or, write direct for Bulletin F-104.

You get a *value dividend* with the "Q" Factor — the built-in QUALITY that provides trouble-free satisfaction and long life in *every* "Buffalo" product.

"Buffalo"

BUFFALO FORGE COMPANY • Buffalo, New York

Buffalo Pumps Division, Buffalo, New York

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING

THE MARK OF QUALITY

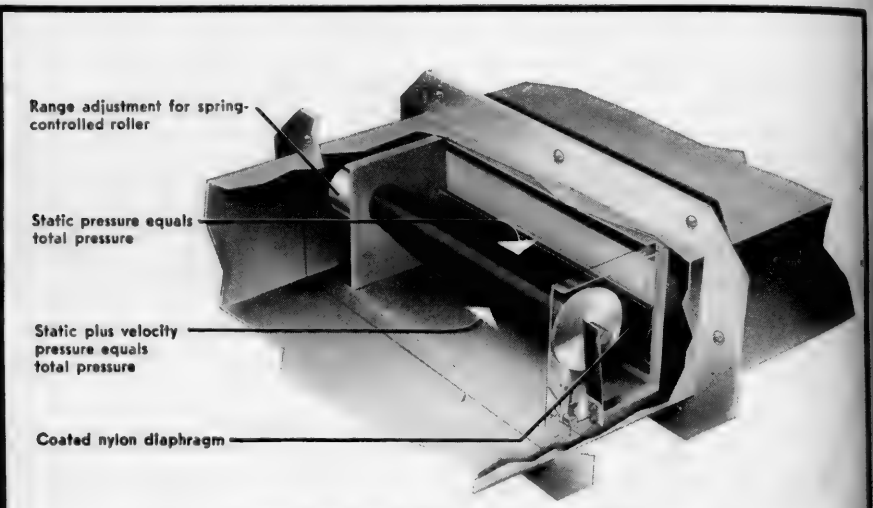
BARBER COLMAN

Uni-Flo

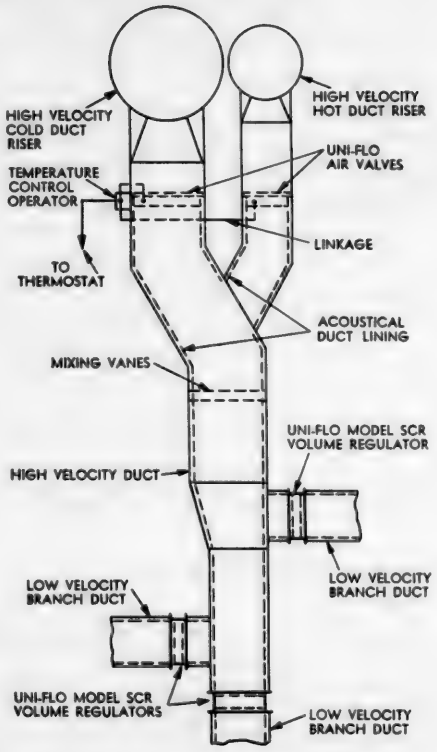
ENGINEERED AIR DISTRIBUTION

New for high velocity systems! Self-operated Constant Volume Regulator

- Maintain cfm delivery within — 5% for inlet air pressure differences as high as 5:1.
- Completely self-contained — requires no power source other than the air flow.
- Fully adjustable before or after installation.


Range adjustment for spring-controlled roller
Static pressure equals total pressure
Static plus velocity pressure equals total pressure
Coated nylon diaphragm

Barber-Colman Model SCR constant volume regulator



Schematic diagram of SCR constant volume regulators installed in high velocity duct system.

The new Uni-Flo Model SCR constant volume regulator is applicable anywhere in a duct system where there are changes in static pressure. No motor operator or other power source is required. Only requirement for its operation is a minimum of 0.75 inches of static pressure.

As illustrated above, both static and velocity pressure exist under the flexible diaphragm where the air can pass through the baffle plate. Static pressure only exists above the diaphragm where the air is trapped.

A static pressure increase above the diaphragm forces it downward, limiting the open area of the baffle plate. Conversely, when static pressure decreases, the diaphragm raises, exposing a larger opening area. Thus, a constant cfm delivery is maintained regardless of pressure changes in the system.

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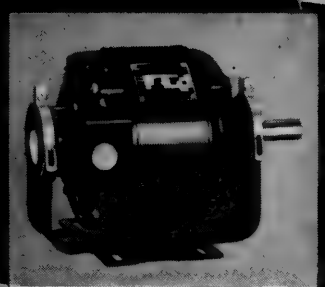

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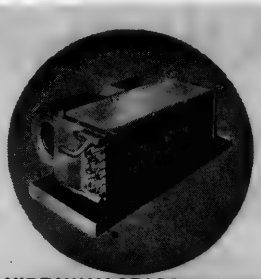

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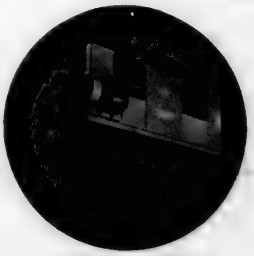

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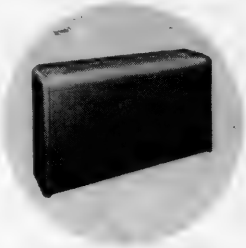

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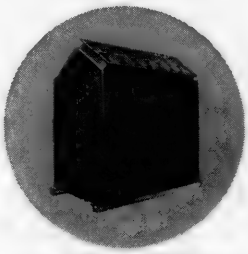

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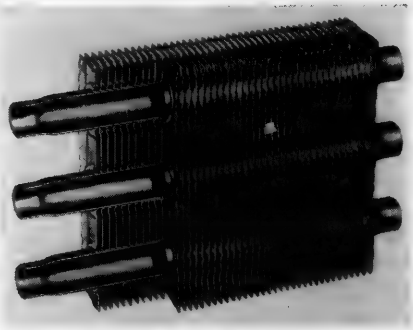

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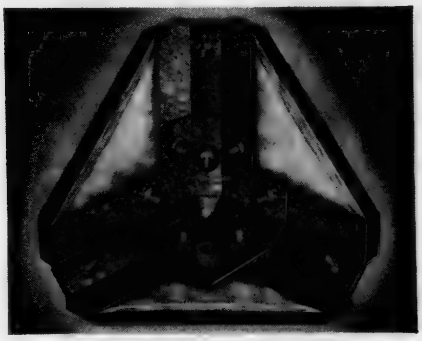

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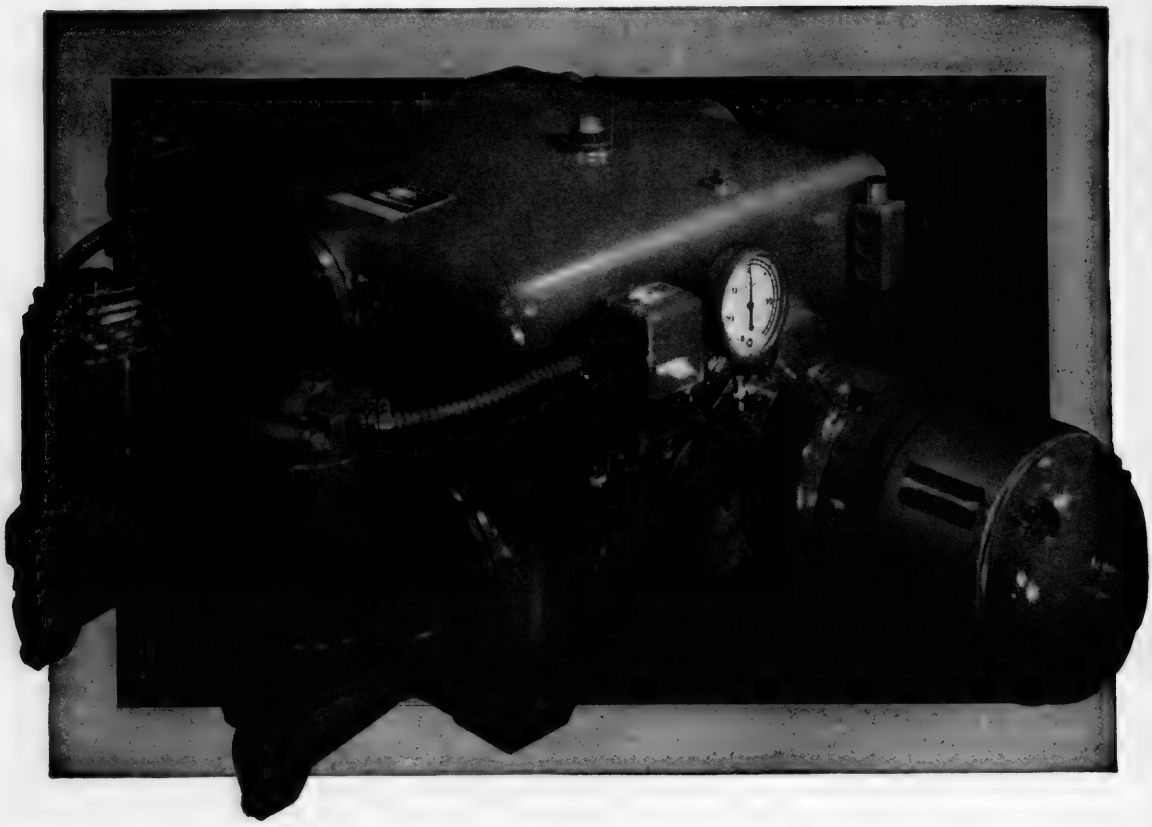

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Eliminating Man-Made Fog

M. A. RAMSEY
Engineer, Worthington Corp.

Fog occurs in many forms and is not always recognized or called by that name. Some fogs occur naturally; others are man-made, such as that in the discharge of a cooling tower, an evaporative condenser or in indoor swimming pools. Man-made fogs can be eliminated, or the cause of fog removed. The approach suggested here is that the solution to a fog problem is just as definite a calculation as any other air conditioning problem. Practice, however, has often been a matter of trial and error. The explanation which follows will serve to eliminate such haphazard experimentation and to point to definite solution.

WHEN an air, water vapor mixture at some condition is mixed with one at another condition, the locus of all possible mixtures will be approximately a straight line between two points which are so located on a psychrometric chart (1) as to represent the condition of the two air-vapor mixtures. If this line is entirely in the area inside of the saturation curve, below 100% rh (the superheat region), there will be no fog at any proportion of the two air-vapor mixtures. If this mixture line is to the left of the saturation curve (the fog region) for any part of its length, proportions of the air-vapor mixtures represented by a point on the locus in that region will result in fog. The farther out from the saturation line, the thicker the fog will be.

In Fig. 1, a line is drawn through points representing condition of 70 deg F with 98% rh, 75 deg with 93% rh and 80 deg with 86% rh at one end and 40 deg with 90% rh, 35 deg with 65% rh and 30 deg with 25% rh at the other end. As this line indicates, any mixture of air (2) at a condition represented by one of the three upper points with air at a condition represented by one of the three lower points will result in some fog if the proportions are such that the mixture temperature is between about 45 deg and 68 deg. These are the two temperature points where the straight line crosses the saturation curve.

The approximate condition of the mixture for various proportions of the two components is located on the mixture line in the same manner as when the line never goes into the fog region.

Now let us further clarify points (1) and (2).

1. This is true for the type of psychrometric chart in general use in which the dry bulb and grains per pound scales are each divided in constant spaces per unit. In other words, the space between 30 deg and 31 deg is the same as the space between 100 deg and 101 deg, and the space between 10 gr per lb and 11 gr per lb is the same as that between 200 gr per lb and 201 gr per lb.

2. Actually, it is the water vapor mixtures that cause the fog and the air itself has practically nothing to do with it. However, it has become so common to talk of air at a particular relative humidity (it is really the water vapor that is at a particular relative humidity) that it will probably be easier reading to say "air" every time an air-vapor mixture is intended.

For example, assume that two parts by weight of the 70 deg with 98% rh (point *B*) is mixed with one part by weight of 40 deg with 90% rh (*C*). The mixture will be 60 deg. It is on the line between the two points, *B* and *C*, such that the distance from the 70 deg condition to the mixture point is ½ of the distance from the 40 deg condition to the mixture point. The mixture line can be divided proportionately by actual length, by enthalpy equivalent, or by a vertical projection of the 60 deg line is shown. Thus the mixture condition would be represented by point *A*. The temperature of the mixture, however, would not be 60 deg but about 61.4 deg since, in the fog region, dry and wet bulb are equal. The temperature is higher than the 60 deg because part of the water vapor has condensed to fog and the latent heat due to this condensation, become sensible heat, slightly raising the mixture temperature.

In Fig. 2, lines just missing the fog region are drawn

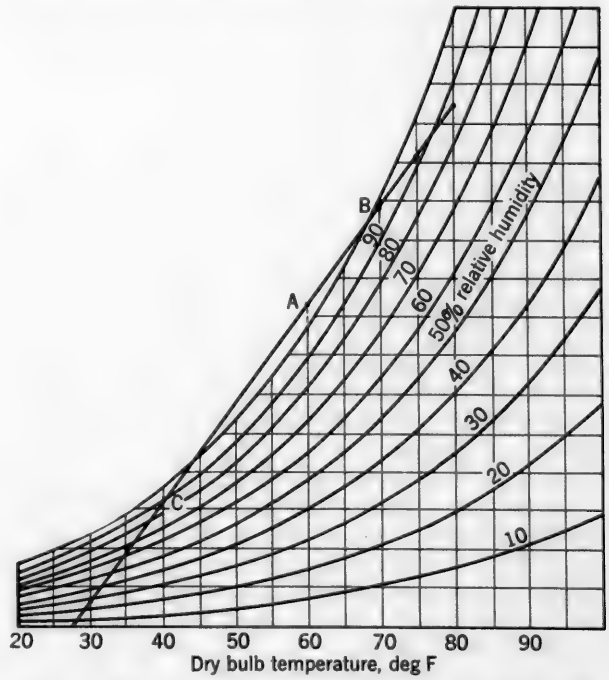


Fig. 1. Solution of problem dealing with two air-vapor mixtures.

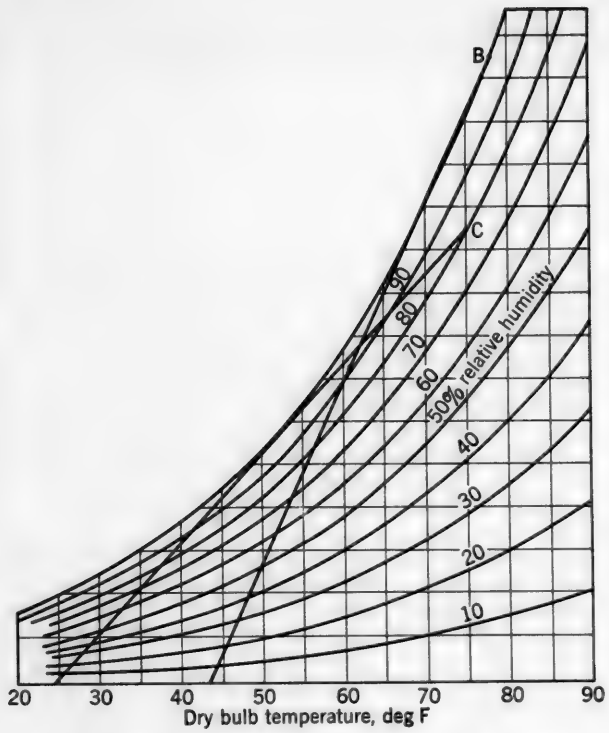


Fig. 2. Solution of another problem based on mixtures.

through point *B* at 78 deg with 100% rh and *C* at 75 deg with 80% rh.

To have any fog result from a mixture with air at condition B, 60 deg air must have a relative humidity above 90% but 45 deg air mixed with B would result in fog if its relative humidity is anything above about 20%. Thus we are likely to produce fog when we exhale, ("see our breath") if the outside temperature is considerably below that of the exhaled air, regardless of the humidity of the outside air. We sometimes see this condition in much warmer weather, but only when the relative humidity of the outside air is very high.

Fog in Swimming Pools or Shower Rooms

For convenience the pool water temperature will be assumed to be kept at 78 deg. This means that the air immediately adjacent to the water will be at a condition represented by point *D* on Fig. 3. Outside air will be either brought in by fans for ventilation or it will leak in. If the condition of the outside air is represented by a point to the right of line *DE* (drawn approximately tangent to the saturation curve at *D*), there will be no fog problem. If the condition of the outside air is represented by a point to the left of the line *DE*, fog will be a problem unless the outside air is heated to a point to the right of *DE* before delivering it to the space.

For example, if the outside air is at 20 deg with 60% rh, it should be heated to at least 50 deg before being discharged into the space. See *FG* on Fig. 3. If the outside condition is represented by *J*, the outside air must be raised to nearly 60 deg. If the temperature of the supply air is also raised so that the condition is to the right of *DE*, fog will never form.

To completely eliminate fog in a shower room may be of insufficient value to warrant the effort, but it can be reduced and kept in reasonable control. If an excessive amount of water is run at such temperatures as 140 deg, the complete elimination of fog would require rather high temperatures. However, some heating of the supply ventilation air can limit it to areas close to the actual showers.

On Fig. 3, *HI* has been drawn such that its upper extension would intersect the saturation curve at about 105 deg which is probably a fairly normal shower temperature. The angle is such that *HI* also intersects the saturation curve at about 88 deg. If air at condition F is heated to 68 deg before discharging to the room, the fog will only extend as far from the shower as a temperature of 88 deg exists. If the outside air is at condition J, it must be heated to about 73 deg to limit the fog to areas where the temperature is 88 deg or above.

Quite often the swimming pool is under a roof exposed to outdoor conditions. If the ventilation is not handled properly, this can result in condensation, dripping, corrosion or rotting, but correct design of the ventilation can completely avoid such a problem.

It is very evident that the air in the pool area and the shower area will have dew points higher than the outside air. The dew point will frequently be above the temperature of the ceiling or the interior of a hung ceiling or wall. This air must be taken outdoors without getting to other areas and discharged where there is no danger of it being picked up again at an intake. One should also realize that under many outdoor conditions, fog will result as this discharge mixes with the outdoor air and it

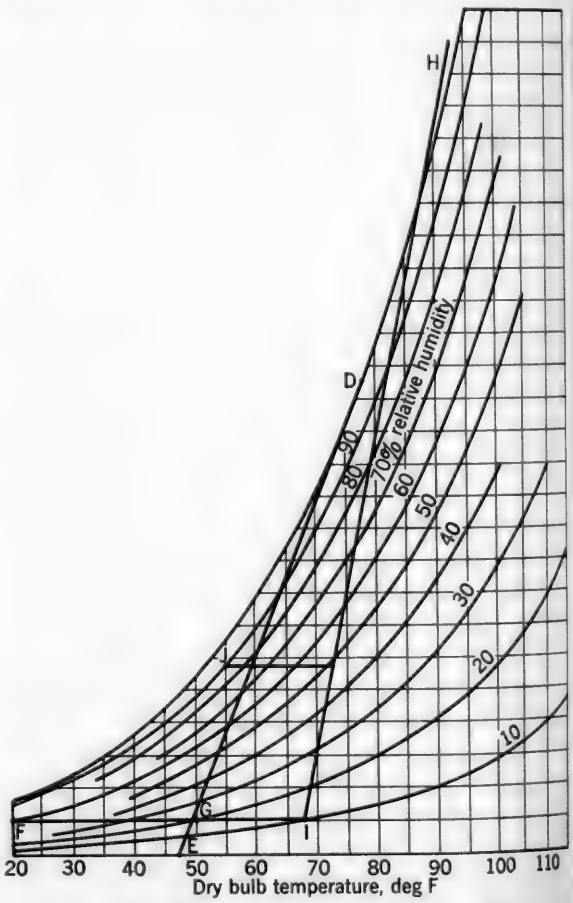


Fig. 3. Solution of problem regarding fog in swimming pools.

should therefore be directed where it will be the least annoying.

The outside supply air should be heated to the desired point and then directed across a ceiling which is cold or through a cold hung ceiling space before it mixes with the room air. Since this air will always have a dew point lower than the temperature of the cold ceiling, hung ceiling space or cold wall, it cannot cause condensation on such surfaces.

The exhaust rate should be slightly greater than the supply so that the high dewpoint air will have no tendency to be forced into other areas.

Fog in Industrial Areas

Usually fog in industrial areas results from high vapor pressures inside with the result that the problem and solution is likely to be much the same as in the pool or shower room. If it is caused by cold surfaces inside, its solution is much the same as for skating rinks.

Fog Above Skating Rinks

When a skating rink is only used in the winter period, fog is usually not a problem but if warm, relatively humid periods occur during its use, it can be disturbing.

The ice surface will probably be maintained between 20 and 28 deg. As an example, assume that it is to be kept at 25 deg. On Fig. 4, a line *KL* has been drawn approximately tangent to the saturation curve at 25 deg. So long as the condition of the air in the space above the rink can be represented by a point below *KL*, there will be no fog. For example, if the temperature in the room is 65 deg, the rh must be less than 58%. If it is 75 deg, the rh must be less than 48%.

Should conditions on line *KM* be maintained, there will be some fog as high above the ice as a temperature below 35 deg exists. If the conditions are above *KM*, there will be a proportionate increase in the density of the fog and its height above the ice.

Fog From Cooling Towers and Evaporative Condensers

There are so many variations of outdoor air surrounding cooling towers or evaporative condensers, that a complete discussion would be rather long. However, mention of a few conditions may help in the solution of others.

On Fig. 5 are located points *N*, *P*, *Q*, and *R* which represent outdoor conditions which might exist. Point *O*

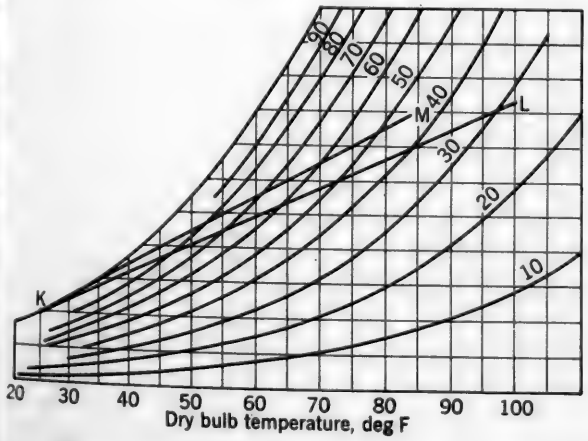
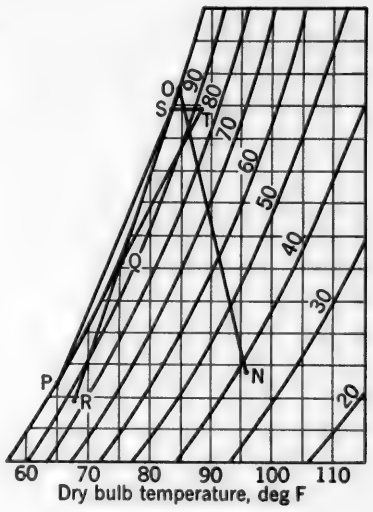


Fig. 4. Problem of fog above ice skating rinks.

Fig. 5. Problem of fog from cooling towers and evaporative condensers.



at 85 deg saturated represents the possible water temperature in an evaporative condenser or the temperature of the water in most intimate contact with the leaving air from a cooling tower. If the outdoor air supplying the evaporative condenser is at condition *N*, no fog will be produced because no points on *NO* are in the fog region. If the outdoor air is at condition *P*, *Q* or *R*, a standard evaporative condenser unit will produce fog, since the air would leave at about a condition represented by point *S*. By "standard" evaporative condenser, is meant one in which all heat transfer surface is wet. With the outside air at conditions *P* or *Q*, the fog would extend a considerable distance from the evaporative condenser outlet. If it was at condition *R*, the fog would only extend to a point where a little more than equal quantity of outside air had mixed with that from the condenser, because as air at conditions *S* mixes with *R*, the state changes along *RS* from *S* toward *R*. After the proportion is such that the *QR* part of the line is reached, there will be no more fog. Some cooling towers have been designed to circulate a part of the air at condition *R* through the tower and the other part around it, mixing the two portions before discharging to the atmosphere. Thus fog will be avoided unless conditions are worse than that indicated by *R*, if equal quantities of air go through and around the tower.

A method of elimination of fog is the heating of air at *S* with a dry coil to a condition like *T*. It will be noted that a very few degrees rise from *S* will avoid fog leaving the condenser and, except at very low outside temperature conditions, it will eliminate fog from the mixture with outside air. In the case of the evaporative condenser at the very low temperature conditions, it would possibly operate with a dry coil and thus cause no fog.

With a cooling tower application the heating from *S* to *T* can easily be done with a steam heated coil or electric heat. It would possibly be more economical with a dry, condenser water heated coil in the leaving air. It is very simple to accomplish this with an evaporative condenser by having the air, after passing through the eliminators, go through a dry surface coil through which the hot discharge refrigerant gas passes before going to the main wetted condenser coil.

Another method of eliminating, or reducing the possibility of fog from an evaporative condenser, is illustrated

in Figure 6. In this case, about half of the coil is operated dry and the other half wet. For assurance of good refrigerant flow, each parallel refrigerant circuit should be

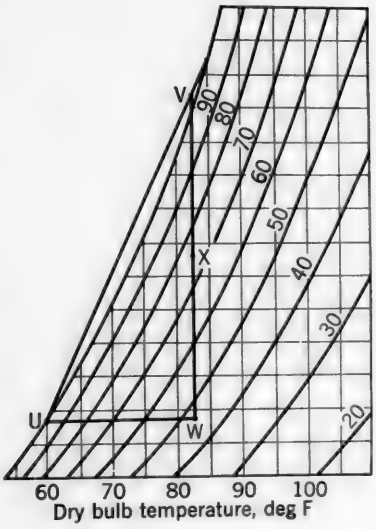


Fig. 6. Another method of fog elimination from an evaporative condenser.

the same proportion dry and should be subjected to air circulation at the same conditions. When air at condition *U* enters the condenser, half passes over the wet surface and reaches condition *V*. The other half passes over the dry surface and reaches condition *W*. (*W* may not be at the same dry bulb temperature as *V*). The mixing of *V* and *W* will result in point *X*, which is well away from the fog region.

This method reduces the capacity of the evaporative condenser but it is usually desirable to have a lower condenser capacity on the days when the fog is a problem. If groups of sprays can be separately controlled, with division plates to keep the unsprayed part of the coil dry, this would be a way of varying the capacity and avoiding fog at the same time for practically any normal condition.

Usually the dry and wet sections should be interspersed to assure proper mixing and avoid fog on one side of the discharge with low relative humidity on the other. If the unit has two or more fans drawing through the coil, each should get some of the two conditions of air so that one fan does not blow fog and the other low relative humidity air.

In some localities the condition of the water is such that alternately wetting a coil and operating dry results in excessive scale forming as the coil dries. For such places, the addition of sensible heat to the discharge air, as previously described, would probably be the method to use.

It is evident that there are many possibilities of controlling or eliminating fog and the most practical or desirable will depend on economic as well as other factors. The variations are far too many to be described in this discussion but the examples will probably help make the principles clearer and suggest further possibilities.

Bureau Completing Underground Corrosion Studies

Researches by the National Bureau of Standards on the corrosion of underground structures, carried on for over 45 years, have been marked by steadily improved understanding of the casual factors at work and by the development of increasingly effective means of preventing the harmful effects that underground corrosion produces. An important phase of the work, now essentially complete, has been an extensive field-burial program to determine the specific behavior of metals and coating materials when exposed for periods up to 17 years in a wide range of soil environments. At the same time, other phases of the corrosion program have led to increased information on the electrical and chemical aspects of the corrosion process, development of methods and instruments for measuring soil characteristics, improvements in the technique of cathodic protection, and virtual elimination of corrosion due to stray-current electrolysis.

There are now in this country about 1 million miles of gas, water, and oil pipelines, 170,000 miles of buried power and communication cables, and an unknown number of tanks, pilings, burial vaults and other structures. The annual cost to the U. S. pipeline industry alone, for protective measures and replacements due directly to corrosion, is estimated at 600 million dollars. A still higher indirect cost results from loss of products, service shutdowns, and loss of life and property by explosion and fire due to leakage from corroded pipes. Furthermore, since corrosion rates are often unknown, engineers have wasted large quantities of material by specifying unnecessarily large thicknesses in their designs.

Until about 35 years ago, underground corrosion was attributed solely to stray electric currents from external sources such as d-c powerlines and electric railways. Such currents pass through parts of underground structures and then discharge to the earth where conditions are favorable; corrosion occurs at the discharge areas.

The seriousness of the problem was recognized by the Congress in 1910, when the Bureau was authorized to investigate the corrosive effects of stray currents and methods for combating them. In 10 years of field and laboratory studies, methods were developed that eliminated stray-current electrolysis as a major factor in underground corrosion. Unexpectedly, however, these studies also showed that serious corrosion often occurred when stray currents were absent.

In 1922 a field burial program was initiated to determine the influence of various properties of soils on the corrosion of buried metals and to develop further methods for reducing corrosion losses. Data were obtained on nearly 37,000 specimens representing 330 varieties of materials. These were exposed for periods up to 17 years in 95 different types of soil at 128 test sites throughout the United States. The last specimens were removed in 1952, and several more years were required to analyze the data. The major field-burial program is now terminated; present work is confined to newly developed materials and the completion of several unfinished studies.

Heating and Ventilating of Large Industrial Buildings Under Heat Loads

FRED E. TUCKER
Industrial Hygienist, Weirton Steel Company
Weirton, West Virginia

Through the installation of area air conditioning systems, a major steel producer eliminated multiple maintenance problems, obtained the maximum amount of conditioned air without excessive expenses for heating the air, provided an efficient method of thermostatic control to maintain uniform room temperatures, and achieved efficient air distribution, at an elevation above the floor, capable of producing maximum value per cubic foot of conditioned air. The following is abstracted from a paper presented to the American Industrial Hygiene Association.

SOME of the largest industrial buildings in America can be found in the steel industry. These buildings are long, narrow structures with high roof bays, sometimes extending more than 100 ft above the floor. A typical modern hot strip mill building may be 1,900 ft long, 120 ft wide and 75 feet high. Most of these buildings are under heat loads which are considerably in excess of normal.

In order to prevent adverse industrial health conditions, it is necessary to exhaust processes guilty of emitting environmental air contaminents. This exhaust ventilation places virtually all industrial buildings under negative pressure. This negative pressure increases the number and velocity of already existing drafts around the perimeter of the building. Old methods of industrial heating are not applicable in the modern era of exhaust ventilation.

In 1943, during the Second World War, Weirton Steel Company constructed a large building to house facilities for the manufacture of shells for the government. It was in this building that the company installed its first controlled damper, area air conditioning system. This system, patented by Mr. W. W. Kompart, former company combustion engineer, has served as a prototype for all future installations in new construction of large buildings. Installed 13 years ago, it is still in operation in this building, now used as a company warehouse.

Since 1943, the company has installed ten additional systems of this design. These consist of four units at 120,000 cfm; three units at 174,000 cfm; and three units at 212,000 cfm, plus the original unit in the shell plant, for a total of almost 2 million cfm. According to figures received from one of our ventilation contractors, these units can be installed, complete with heating coils, fan, ductwork, and automatic thermostat controls, for less than 50 cents per cu ft of air capacity.

In designing this system, the Engineering Department sought a system that would eliminate the multiple maintenance problems encountered in the use of small units; a maximum amount of conditioned fresh air (not less than 2 cfm per sq ft of floor area) without unduly increasing the cost of heating the air; an efficient method of thermostatic control to maintain constant uniform room temperatures and eliminate manual control of the system; and efficient air distribution at an elevation above the floor

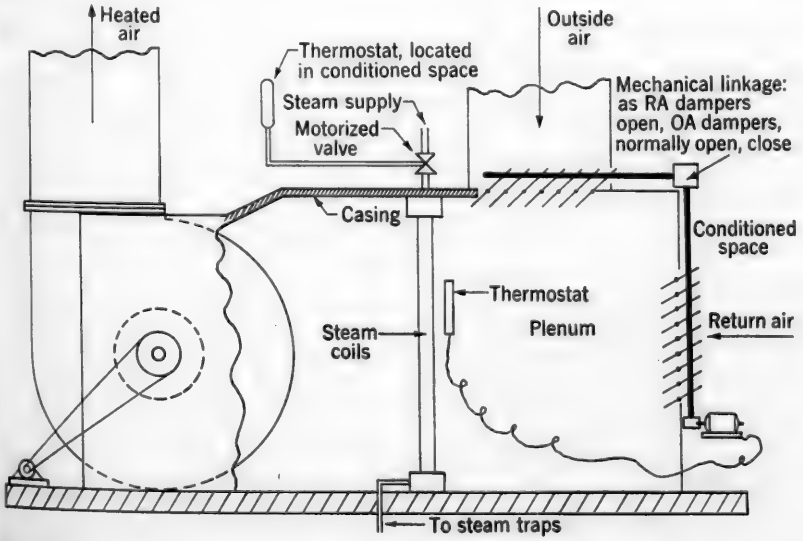


Fig. 1. Central heating and ventilating unit for steel plant building.

Fred E. Tucker, who holds a Bachelor of Science degree in bio-chemistry from Mount Union College, Alliance, Ohio, has been with Weirton Steel since 1949 and has specialized in industrial hygiene. He has presented technical papers on the subject before several national organizations, and his papers have also appeared in a number of publications. He is a member of the American Industrial Hygiene Association, the Industrial Hygiene Foundation of America, Inc., and the subcommittee on Industrial Hygiene, of American Iron and Steel Institute.

capable of producing maximum value per cubic foot of conditioned air.

Figure 1 shows the system designed to accommodate these objectives. The thermostat mounted in the plenum regulates the position of the dampers so that when the outside air temperature is above 32 deg F, the dampers remain in their normally open and closed position. As the outside air drops below 32 deg, the thermostat actuates the drive unit and progressively closes the outside air damper and opens the recirculating air damper so as to admit sufficient recirculated air to maintain a mixed air temperature of about 32 deg in the plenum.

A thermostat mounted in a suitable location in the area to be heated controls the amount of steam supplied to the heating coils. For most installations, room temperature during cold weather is maintained at 74 deg.

The steam radiator is so designed that when the air in the plenum has a temperature equal to 32 deg, which is the temperature at which the recirculating damper begins to open, the radiator operates at maximum capacity to maintain air temperature of 120 deg at the fan outlet.

There is maintenance on one fan, one fan motor, and one set of steam coils, whereas a comparable system designed on a unit basis would have required from ten to twenty such individual maintenance problems. By making provision for recirculation of small amounts of room air, peak loads on the heating system during extremes in cold weather have been eliminated. This has made possible the delivery of large quantities of outside air during hot weather for area cooling, while maintaining a sensible heating cost during colder periods.

Recirculation of air in industrial ventilation always brings up questions of contamination of the air being discharged from the system into the working environment. On only 9 days during the year 1955 was it required to recirculate air for a period of 24 hours, the days when the maximum temperature for the day dropped below 32 deg. In order to recirculate 50% in-plant air, the outside air temperature would have to go below —10 deg. The lowest recorded temperature for the year was —4 deg, on February 3 and 4. On these two days, for very short periods of time, approximately 46% of the total amount of air handled by these systems was recirculated.

Air Distribution

Conditioned air distribution in an area air conditioning system, such as is described here, is also the most expensive part of the system. Controls, heating coils, and fan costs are almost incidental to ductwork costs. This fact makes it very easy for the design engineer, always of necessity conscious of cost, to take short cuts in distribution and supply which seriously impair the efficiency of the system.

Air distribution in steel plant buildings is complicated by the almost universal use of overhead cranes and crane runways. This means that all vertical drops must come down on either the outside walls or between the crane rails of two adjacent runways. Instead of one row of vertical drops down in the center of the building, it is necessary to make one row of drops on each side of the building.

A ventilation system was recently installed in a large building housing a high speed continuous annealing line. The annealing furnace has a maximum heat requirement of 80 million Btu per hr and approximately 1,000 kw. It is the only heat source of any significance located in this building. The building itself is 560 ft long, 121 ft wide, and 120 ft high. Heating and ventilation in this building requires the use of two 174,000-cfm area air conditioning systems located at opposite ends of the building. In the center of the building, directly above the annealing furnace, is a large, high bay, gravity exhaust ventilator.

Outside makeup air is brought in through two small penthouses located on the low bay roof sections. Furnace heat and products of combustion are allowed to escape through the high bay gravity ventilator located directly above the annealing furnace. By bringing the air in around the perimeter of both ends of the building and exhausting directly above the heat source, conditioned makeup air is swept across the all floor areas, and spent air, plus furnace heat and products of combustion, is exhausted out through the gravity ventilator. The basic idea in this design is not new and is almost identical to that used years ago when the sides were removed from the buildings with gravity ventilators providing exhaust through the roofs. The important difference, and one of the main reasons for the installation of area air conditioning systems, is good air distribution. To obtain employee satisfaction, hot and cold spots must be eliminated in the working environment. The human body can easily recognize temperature differentials of $\pm$ 2 deg.

Distribution in this building requires the use of seventy separate discharge outlets. Each outlet contains six vertical vanes preset for uniform air distribution. Each outlet is equipped with a manually operated damper control system. Outlets are located between 10 and 12 ft above floor level and are directed toward the floor at an angle of approximately 45°. This elevation and angle of discharge was chosen to obtain maximum coverage per cubic foot of discharged air. A typical row of discharge outlets, those along the northwest wall of the continuous annealing building, permits the overhead crane freedom of travel for the entire length of the building. The vertical drops are located between the crane rail and the siding.

The velocities maintained in these systems are as follows: Intake—1,000 fpm (maximum), across the heating coils—1,000 fpm, fan outlet velocity—2,500 fpm, main runs—2,200 fpm, drops to floor—1,400 fpm, discharge outlets—950 fpm. Discharge outlets deliver 5,925 cfm. These outlets are so arranged to supply not less than 2 cfm of conditioned air per square foot of floor area. This minimum figure of 2 cfm per sq ft has been proven by actual experience on previously installed systems to provide satisfactory cooling for the majority of operations at Weirton. There are, of course, isolated locations throughout the company's plants where intense localized heat loads require supplementary spot cooling.

Permanent Pressure Gages Spot Ventilation Troubles

GEORGE M. HAMA
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Gages installed at certain strategic locations and connected for reading at a central panel provide ready means for early spotting of any need for maintenance action.

INDUSTRIAL exhaust ventilation systems which initially have provided good environmental control often fail to sustain that control after a period of operation because of inadequate maintenance or misdirected maintenance efforts. Also, the fact that control has diminished is sometimes unnoticed by management until illness or complaints result or until conditions become so grossly bad that the plant is fogged or clouded with contaminated air.

Sources of Failure

Trouble-shooting for the causes of failure is difficult if conducted on a hit-or-miss basis, because there are just too many possible reasons for a system to fail. Some of the frequent causes of failure are as follows:

(1) Damaged hoods;
(2) Damaged duct work obstructing airflow;
(3) Decreased airflow because of clogged ducts;
(4) Decreased airflow at hoods because of leaks or holes in duct work;
(5) Decreased airflow because of high resistance in dust collector;
(6) Dust collector failure caused by broken dust collector bags in dry collectors or, in wet collectors, failure to turn on or supply sufficient water;
(7) Decreased airflow because of fan belt slipping or fan becoming clogged, corroded, or abraded;
(8) Decreased airflow because of fan running backwards. (Centrifugal fans will deliver 20-30% of rated airflow when run backwards.)

Locating the Trouble

Items, 1, 2, 4 and 6 can be determined readily by visual inspection of the system.

Items 3, 5, 6, 7 and 8 can be determined by means of permanent pressure gages located at a convenient observation point. The gages can be of the simple liquid U-tube manometer type (Fig. 1) or of the mechanical type with an indicating dial (Figs. 2 and 3). These gages should be observed at least once daily. On a new system a record should be kept to indicate optimum operating pressures.

Use of Pressure Gages

The gages should be located as shown in Fig. 4. Gage *A* should be connected to read the pressure across the dust collector, one side of the gage is connected to the outlet of the collector, the other side is connected to the inlet of the collector. The holes for connection to the gage should be drilled on the upper side or top of the duct so they do not clog with dirt.

Gage *B* is connected to read static pressure in the main duct just before it enters the dust collector. The other

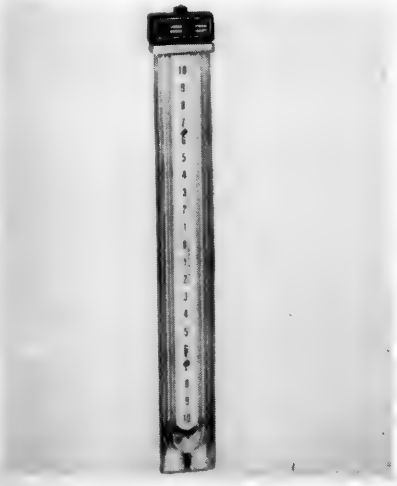

Fig. 1. U-tube manometer.

Fig. 2. Dial type pressure gage.

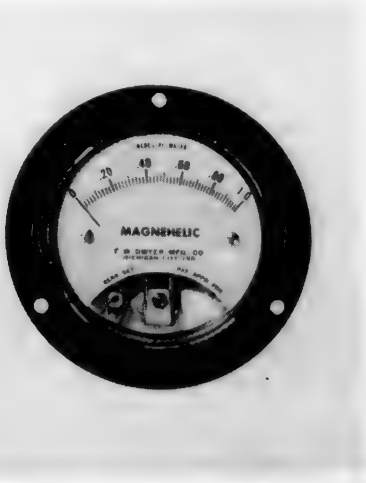

Fig. 3. Dial type pressure gage.

side of the pressure gage or U-tube manometer is open to the atmosphere.

The pressure readings on gages *A* and *B* should be recorded for a period of time on a new or properly operating system to establish normal operating pressures. If after a period of time, gage readings for *A* and *B* deviate substantially from the normal trend (10 to 20% or more), failure of deterioration of the system is indicated. The cause of the trouble may be indicated from the gages as follows:

Gage A	*Gage B*	*Condition*
Normal	Normal	Establish normal when system is new or operating satisfactory.
High	Low	Airflow low. Clogged dust collector. (Dirty bags if dry collector.)
Very Low	High	Airflow high. Broken bag. Excessive outdoor air pollution. Overloaded motor. (Wet collector water not turned on.)
Slightly Low	High	Clogged or blocked ducts.
Low	Low	Belt slipping. Fan clogged. Fan running backwards. Fan damaged.

Example: A grinding wheel dust collector system is designed to operate at 9 in. w.g. static pressure at the fan inlet. A cloth screen arrestor has been installed. Its resistance is rated at 3½ to 4 in. w.g. Pressure gage *A* should be purchased with at least 6-inch w.g. scale. Pressure gage *B* should have a scale larger than the static pressure at the inlet minus the arrestor resistance. A 6-inch scale would be a good selection.

The system, new and in good condition, indicated the following readings: Gage *A*—4 in. w.g.; Gage *B*—5 in. water gage.

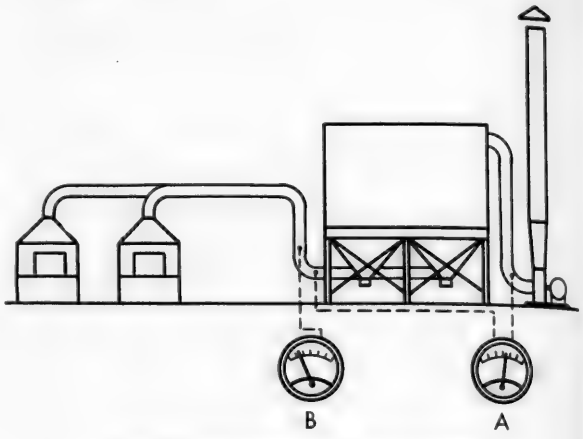

Fig. 4. Pressure gage connections.

During a period of operation the following readings were obtained; the causes of failure are also given:

Gage A	*Gage B*	
4 in. w.g.	5 in. w.g.	Normal satisfactory.
6	4	Clogged dirty collector bags.
2	6½	Broken collector bags.
3½	6	Clogged ducts, or damaged ducts.
3	3½	Belt slipping, fan clogged.

Friction in Curved Pipe

An investigation of pressure losses in curved tubing has yielded empirical formulas that enable the designer to predict the flow of fluid, and hence the performance of heat exchangers for heating and air conditioning. Research was carried out by Prof. H. Ito, Tohoku University, Sendai, Japan, and presented as Paper No. 58—SA-14 to the Semi-Annual Meeting of the American Society of Mechanical Engineers.

Smooth, drawn-copper tubing was used in the tests, with various inside diameters of approximately ⅝ and 1⅜ inches. The friction factor of curved pipe, f_c, was defined in the equation

$$h = (f_c)\,(l_c/d)\,(v_m^2/2g)$$

where h is the loss of head in friction, l_c and d the axial length and internal diameter of the curved pipe, v_m the mean velocity of flow, and g the acceleration of gravity.

Within the range

$$300 > R_e(r/R)^2 > 0.034$$

the following equation is in good agreement with the experimental results:

$$f_c(R/r)^{1/2} = 0.029 + 0.304\,[R_e(r/R)^2]^{-0.25}$$

where R is the radius of curvature of pipe axis, r is the radius of the cross section, and R_e is the Reynolds number, $2v_m r/\nu$, ν being the kinematic viscosity of the fluid. Below that range, the friction factor for curved pipe is very close to that of straight pipe, and above that range the equation becomes

$$f_c(R/r)^{1/2} = 0.316\,[R_e(r/R)^2]^{-1/5}.$$

Experimental results can also be expressed in terms of Y, defined by the equation

$$Y^3 e^Y = R_e(R/r)^{1/2}$$

when

$$Y^2(r/R)^{1/2} < 12$$

as

$$f_c(R/r)^{1/2} = 0.0323 + 1.6\,[Y^2(r/R)^{1/2}]^{-1.27}.$$

For values

$$Y^2(r/R)^{1/2} > 5.3$$

the equation

$$f_c = 1.186/Y^2$$

holds with sufficient accuracy for engineering purposes.

PER-CENT OF CONDENSATE FLASHED TO STEAM

High Pressure System			Pressure in Low Pressure System, Lb. per Sq. In. Abs.										
			1	5	10	14.7	20	25	30	35	40	45	50
			Latent Heat in Flash Steam, Btu per Lb.										
Sat. Pressure, Lb. per Sq. In. Abs.	Sat-uration Temper-ature, Deg.F	Enthalpy of Sat. Liquid Btu per Lb.	1036	1001	982.1	970.3	960.1	952.1	945.3	939.2	933.7	928.6	924.0
			Volume of Steam, Cu. Ft. per Lb.										
			333.6	73.5	38.4	26.8	20.1	16.3	13.7	11.9	10.5	9.4	8.5
			Percent of High Pressure Condensate Flashed at Low Pressure										
5	162.2	130.1	5.8	—	—	—	—	—	—	—	—	—	—
10	193.2	161.2	8.8	3.1	—	—	—	—	—	—	—	—	—
14.7	212.0	180.1	10.7	5.1	1.9	—	—	—	—	—	—	—	—
20	228.0	196.2	12.2	6.6	3.6	1.7	—	—	—	—	—	—	—
25	240.1	208.4	13.4	7.8	4.8	2.9	1.3	—	—	—	—	—	—
30	250.3	218.8	14.4	8.9	5.9	4.0	2.4	1.1	—	—	—	—	—
35	259.3	227.9	15.2	9.8	6.8	4.9	3.3	2.1	1.0	—	—	—	—
40	267.3	236.0	16.0	10.6	7.6	5.8	4.4	2.9	1.8	0.9	—	—	—
45	274.4	243.4	16.7	11.3	8.4	6.5	4.9	3.7	2.6	1.7	0.8	—	—
50	281.0	250.1	17.4	12.0	9.1	7.2	5.6	4.4	3.3	2.4	1.4	0.7	—
55	287.1	256.3	18.0	12.6	9.7	7.9	6.3	5.0	4.0	3.0	2.2	1.4	0.7
60	292.7	262.1	18.5	13.2	10.3	8.4	6.9	5.6	4.6	3.6	2.6	2.0	1.3
65	298.0	267.5	19.1	13.7	10.8	9.0	7.4	6.2	5.2	4.2	3.4	2.6	1.9
70	302.9	272.6	19.5	14.3	11.3	9.5	8.0	6.7	5.7	4.8	3.8	3.1	2.4
75	307.6	277.4	20.0	14.7	11.8	10.0	8.5	7.3	6.2	5.3	4.4	3.7	3.0
80	312.0	282.0	20.4	15.2	12.3	10.5	8.9	7.7	6.7	5.8	4.9	4.2	3.5
85	316.3	286.4	20.9	15.6	12.8	11.0	9.4	8.2	7.2	6.2	5.4	4.6	3.9
90	320.3	290.6	21.3	16.1	13.2	11.4	9.8	8.6	7.6	6.7	5.8	5.1	4.4
95	324.1	294.6	21.7	16.5	13.6	11.8	10.3	9.1	8.0	7.1	6.3	5.5	4.8
100	327.8	298.4	22.1	16.8	14.0	12.2	10.7	9.5	8.4	7.5	6.7	5.9	5.2
110	334.8	305.7	22.8	17.5	14.7	12.9	11.4	10.2	9.1	8.2	7.4	6.6	6.0
120	341.3	312.4	23.4	18.2	15.4	13.6	12.1	10.9	9.9	9.0	8.2	7.4	6.8
130	347.3	318.8	24.0	18.9	16.0	14.3	12.8	11.6	10.6	9.7	8.9	8.1	7.4
140	353.0	324.8	24.6	19.3	16.6	14.9	13.4	12.2	11.2	10.3	9.5	8.8	8.1
150	358.4	330.5	25.2	20.0	17.2	15.5	14.0	12.8	11.8	10.9	10.2	9.4	8.7
160	363.5	335.9	25.7	20.6	17.8	16.0	14.5	13.4	12.4	11.5	10.7	10.0	9.3
170	368.4	341.1	26.2	21.1	18.3	16.6	15.1	14.0	12.9	12.1	11.3	10.5	9.9
180	373.1	346.0	26.7	21.6	18.8	17.1	15.6	14.5	13.4	12.6	11.8	11.0	10.4
190	377.5	350.8	27.1	22.1	19.3	17.6	16.1	15.0	14.0	13.1	12.3	11.5	10.9
200	381.8	355.4	27.6	22.5	19.7	18.0	16.6	15.5	14.4	13.6	12.8	12.1	11.4
225	391.8	366.1	28.6	23.6	20.8	19.1	17.7	16.6	15.6	14.7	14.0	13.2	12.6
250	401.0	376.0	29.8	24.6	21.8	20.2	18.7	17.6	16.6	15.8	15.0	14.3	13.6
275	409.4	385.2	30.4	25.5	22.8	21.1	19.7	18.6	17.6	16.7	16.0	15.3	14.6
300	417.3	393.8	31.3	26.4	23.6	22.0	20.6	19.5	18.5	17.7	16.9	16.2	15.5
350	431.7	409.7	32.8	28.0	25.2	23.6	22.2	21.1	20.2	19.4	18.6	17.9	17.3
400	444.6	424.0	34.2	29.4	26.8	25.1	23.7	22.6	21.6	20.9	20.1	19.4	18.9
450	456.3	437.2	35.4	30.7	28.0	26.4	25.1	24.0	22.8	22.2	21.5	20.8	20.1
500	467.0	449.4	36.6	31.9	29.3	27.7	26.1	25.3	24.4	23.6	22.8	22.2	21.6
1000	544.6	542.4	45.6	41.2	38.8	37.2	36.0	35.1	34.2	33.5	32.8	32.2	31.7

High Pressure System			Pressure in Low Pressure System, Lb. per Sq. In. Abs.										
			55	60	65	70	75	80	85	90	95	100	110
			Latent Heat in Flash Steam, Btu per Lb.										
Sat. Pressure Lb. per Sq. In. Abs.	Saturation Temperature, Deg. F.	Enthalpy of Sat. Vapor, Btu per Lb.	919.6	915.5	911.6	907.9	904.5	901.1	897.8	894.7	891.7	888.8	883.2
			Volume of Steam, Cu. Ft. per Lb.										
			7.8	7.2	6.7	6.2	5.8	5.5	5.2	4.9	4.7	4.4	4.05
			Percent of High Pressure Condensate Flashed at Low Pressure										
60	292.7	1177.6	0.6	—	—	—	—	—	—	—	—	—	—
65	298.0	1179.1	1.2	0.6	—	—	—	—	—	—	—	—	—
70	302.9	1180.6	1.8	1.1	0.6	—	—	—	—	—	—	—	—
75	307.6	1181.9	2.3	1.7	1.1	0.5	—	—	—	—	—	—	—
80	312.0	1183.1	2.8	2.2	1.6	1.0	0.5	—	—	—	—	—	—
85	316.3	1184.2	3.3	2.7	2.1	1.5	1.0	0.5	—	—	—	—	—
90	320.3	1185.3	3.7	3.1	2.5	2.0	1 5	1.0	0.5	—	—	—	—
95	324.1	1186.2	4.2	3.5	3.0	2.4	1.9	1.4	0 9	0 4	—	—	—
100	327.8	1187.2	4.6	4.0	3.1	2.8	2.3	1 8	1 3	0.9	0.4	—	—
110	334.8	1188.9	5.7	4.7	4.2	3 6	3 1	2.6	2.1	1.7	1.2	0.8	—
120	341.3	1190.4	6.1	5.5	4.9	4.4	3.9	3.4	2 9	2.4	2.0	1.6	0.8
130	347.3	1191.7	6.8	6 2	5.6	5 1	4.6	4.1	3.6	3 2	2.7	2.3	1.5
140	353.0	1193.0	7.5	6.8	6.3	5.7	5 2	4.7	4.3	3.8	3.4	3.0	2.2
150	358.4	1194.1	8.1	7.5	6.9	6.4	5.9	5.4	4.9	4.5	4.0	3.6	2.8
160	363.5	1195.1	8.7	8.1	7.5	7 0	6.5	6.0	5.5	5.1	4.6	4.2	3.4
170	368.4	1196.0	9.2	8.6	8.1	7.5	7.0	6.6	6.1	5.6	5.2	4.8	4.0
180	373.1	1196.9	9.8	9.2	8.6	8.1	7.6	7.1	6.6	6.2	5.8	5.4	4.6
190	377.5	1197.6	10.3	9.7	9.1	8.6	8.1	7.6	7.2	6.7	6.3	5.9	5.1
200	381.8	1198.4	10.8	10.2	9.6	9 1	8.6	8.1	7.7	7 2	6.8	6.4	5.6
225	391.8	1199.9	11.9	11.4	10.8	10.3	9.8	9.3	8.9	8.4	8.0	7.6	6.8
250	401.0	1201.1	13.0	12.4	11.9	11.4	10.9	10.4	10.0	9.5	9.1	8.7	8.2
275	409.4	1202.1	14.0	13.4	12.9	12.4	11.9	11.5	11.0	10.6	10.2	9.8	9.0
300	417.3	1202.8	15.0	14.4	13.9	13.3	12.9	12.4	12.0	11.5	11.1	10.7	10.0
350	431.7	1203.9	16.7	16.1	15.6	15.1	14.6	14.2	13.8	13.3	12.9	12.5	11.8
400	444.6	1204.5	18.2	17.7	17.2	16.7	16.2	15.8	15.3	14.9	14.5	14.1	13.4
450	456.3	1204.6	19.6	19.1	18.6	18.1	17.7	17.2	16.8	16.4	16.0	15.6	14.9
500	467.0	1204.4	21.0	20.5	20.0	19.5	19.0	18.6	18.2	17.7	17.4	17.0	16.3
1000	544.6	1191.8	31.1	30.6	30.2	29.7	29.3	28.9	28.5	28.1	27.8	27.5	27.0

The purpose of the accompanying table is to simplify calculations in connection with flash steam.

As an example of the use of the table, if saturated water at 70 psi and 303 deg F with enthalpy of 272.6 Btu per lb is discharged into a tank maintained at 20 psia, it must immediately assume the saturation conditions of the lower pressure, 228 deg and 196.2 Btu per lb. Some of the energy which had formerly held the temperature at 303 deg is converted into latent heat of steam at the new temperature. The amount of energy so converted is 272.6 — 196.2 = 76.4 Btu per lb. Since the latent heat of steam at 20 psia is 960.1 Btu per lb, this excess heat is enough to produce 76.4/960.1 or 0.08 lb of steam per lb of high temperature condensate, or, in other words, 8% of the condensate will flash into steam at the lower pressure.

In using the table, instead of making the foregoing calculations, enter the table at 70 in the left hand column and move to the right under the column headed at the very top 20 and find that 8.0 per cent of the high pressure condensate will be flashed at low pressure.

Toxicity and Fire Potentialities of

Common Chemicals in Industry

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This article is written for the industrial plant too small to employ a safety engineer or an industrial hygiene engineer but which, nevertheless, requires guidance to promote health and safety of plant personnel and to prevent fires as the result of the chemicals or processes used. Since it is impossible, because of space limitations, to mention the ever-increasing number of chemicals produced or used in industry, emphasis is placed on common industrial chemicals and normal manufacturing processes. This is Part I of a two-part article.

AN ARTICLE covering common chemicals used in industry can easily become involved with details regarding chemical production procedures and other facts divorced from the field of this discussion. Therefore, two important points are now introduced.

1. For the chemicals covered, emphasis is placed on data dealing with their toxic, dermatitis or fire potentialities resulting from so-called normal industrial operations or processes.
2. With few exceptions, practically every type of nuisance, toxic or fire potential chemical used in or resulting from an industrial process, may be handled with safety, if proper and adequate controls are provided and used for the protection of industrial personnel.

A number of common chemicals and industrial processes are treated separately and guidance given for the protection of plant personnel and the elimination of health hazards.

Carbon Monoxide

This "killer gas" (specific gravity 0.967) is tasteless, odorless and invisible. Throughout the ages, deaths from carbon monoxide asphyxiation have continued to increase at an alarming rate.

Garage mechanics suffer from carbon monoxide exposure during the winter and on rainy days when doors and windows are shut. There are just a few precautions to be taken for protecting garage personnel. Customers and mechanics should be prohibited from idling cars unless absolutely necessary. When car idling is necessary, during motor tune-up or valve adjustment periods, connection should be made from the exhaust pipe of the muffler to an overhead or underground mechanically operated exhaust system. In this manner, positive elimination of the exhaust gases is definitely assured.

To purge the garage area when cars enter or leave, window or roof propeller fan units may be utilized. A more expensive but more effective approach is to provide a series of vertical exhaust ducts extending down to the floor to remove the heavy irritating products of combustion discharge from the muffler.

Gasoline

Exposure to leaded gasoline is usually adequately controlled in refineries where tetraethyl lead is used as an additive to gasoline. The unsupervised, promiscuous use of leaded gasoline for cleaning purposes in garages or in industrial plants presents a serious fire hazard, aside from the potentiality of lead poisoning due to skin absorption.

Gasoline vapors will flash at about —50 deg F. Recently a foreman purchased some gasoline at a gasoline station near his plant. During a subsequent inspection, the vapors of gasoline were definitely detectable. After a series of negative answers to leading questions concerning the vapors, he finally admitted the use of the prohibited gasoline as a cleaning solvent. His defense was that it was "white" gasoline. He did know there was a leaded and a white or non-leaded gasoline, but was somewhat chagrined when he was asked if the white gasoline would burn.

Use of gasoline should not be permitted in any plant area for any purpose whatsoever, except as fuel for some types of equipment. This should be a top-management requirement, and abuse of this should call for stringent and immediate supervisory action. A flash fire may not only involve the individual, but may also include some co-workers and usually the plant itself. Garage and maintenance personnel are the ones most guilty of this serious malpractice.

Commercial equipment is available which may be attached directly to the exhaust of a gasoline engine, replacing the muffler, to burn or oxidize carbon monoxide. This equipment may be used with engines whether leaded or non-leaded gasoline is used as fuel. It works with either.

During the interim of development for equipment to function with leaded gasoline, research and development produced equipment to utilize L.P. gas (liquefied petroleum). There are inherent dangers to the use of L.P. gas, such as filling the tank from a central source of supply. This may be overcome by a properly indoctrinated attendant. An alternative is to replace the empty tank or cylinder with a new supply unit such as is done

with the domestic gas supply for homes located away from normal gas line areas.

Under no circumstances should tow-motors, fork-lifts or pay-loader equipment be filled from a 55 gal drum of gasoline within a plant. If a gasoline pump is located within a plant building, then a certificate should be obtained from the fire insurance carrier, city, or state regulatory agency, that the pump is Underwriter approved equipment.

Chlorinated Solvents Used for Metal Cleaning

Within the past 25 years, two moderately toxic solvents have been used in the metal processing and fabrication industries for surface cleaning, previous to the metal being plated or coated by spraying, dipping or roller-coating.

These solvents, trichlorethylene and perchlorethylene, are used extensively. The maximum allowable vapor concentration for continuous daily 8-hour exposure has been set at 200 ppm (parts of vapor in one million parts of air).* While vapors of both solvents are non-flammable, when in contact with a hot flame such as is produced within an oil burner or by a welding torch, the vapors may be dissociated. This may also occur with vapors of carbontetrachloride. One of the products of this dissociation is phosgene, a poisonous gas. There are references in the medical literature describing near-fatalities resulting from degreasing tanks located as far as 150 ft. from a hot flame. Open doorways or internal air drafts between operating departments, at times aided by overhead unit heaters used for winter heating or summer air circulation purposes, have been responsible for these case histories.

A degreasing tank utilizing trichlorethylene as the solvent is usually provided with a peripheral cooling chamber located on the outside of the tank surface, plus a bank of four to five rows of cooling coils placed on the inside surface of the tank. These cooling units, utilizing city water as the cooling media, normally are capable of condensing the hot solvent vapors which tend to escape from within the tank area. The temperature and quantity of water flowing through the inner and outer cooling units, and the control of heat input to the solvent within the tank (that is steam, gas, or electric heating elements), tend to create a heat balance based on the quantity of metal processed per unit of time. From a practical operating standpoint, this never seems to be achieved due to the following upsetting conditions:

1. The use of an overhead hoist for lowering and lifting a mesh basket of processed stock is usually operated above the 11 fpm up and down travel, as recommended by the manufacturers of degreasing equipment. As a result there is an excessive vapor displacement from within the tank to the breathing zone of the operator due to this piston-type action of the basket, and also to the surrounding plant area. If the unit is located within a small isolated room, a usual location, operator exposure becomes excessive. As a result, some States require slot exhaust along the two long sides of the tank. This again tends to draw excessive vapor out of the tank, increasing solvent loss, which may be a costly item over a period of time.

2. Other conditions which increase solvent vapor dispersion from within the tank are open windows, the use of wall or portable desk or pedestal fan units to aid in blowing-away the vapor from the operator's breathing zone, tank location near a stair-well, elevator-well and, worst of all, location adjacent to exhaust provided for plating room tank units or buffing and polishing equipment.

3. In the final analysis, operators must be carefully trained by field technicians of the degreasing equipment manufacturer and periodically checked for the unconscious development of operator malpractices. In view of the usual haphazard supervisory attention, severe and costly malpractices are normally evident in most installations.

A degreasing tank utilizing perchlorethylene as the solvent is not provided with any cooling chamber or coils. Control is provided by means of a thermostat, located in a recess in the vapor zone within the tank. This thermostat tends to regulate the temperature of the solvent vapor by regulating the heat input to the unit.

In many instances, atmospheric concentrations in the breathing zone, when perchlorethylene is used, have been found to exceed those evaluated, when trichlorethylene is used with the two types of cooling aids previously mentioned.

Results of Exposure

Two other important items should be mentioned in connection with the use of these two solvents for degreasing purposes:

1. Contact with the skin will produce a severe dermatitis since, being degreasing solvents, they will dissolve or defat the skin of the essential protective oils, dry the skin, and pave the way for an infection or resulting rash or dermatitis.

2. Both solvents are members of the narcotic family. Those who are addicted to the use of liquor experience the sensation of a "Scotch Jag" due to the continual inhalation of the vapor. When this condition is evident, as has been found in many instances, the operator should be transferred to some other work.

During lunch-time, some operators from other areas may casually stand near the tank and may "sniff" enough solvent vapor to carry them through the afternoon work cycle in a very buoyant manner.

Acids or Hot Alkaline Solutions for Metal Cleaning

The normal cold dilute sulfuric or hydrochloric acid cleaning solutions present no toxicity problems. The main exposure is the handling of acid from a carboy to an open bucket. Acid splash may result in severe burns to hands, face and particularly eyes. Operators should be provided with and be required to wear rubber gloves, face shields and eye protection when any acids are handled, after they are properly indoctrinated. They should be periodically checked to see that they conform to their original training.

Hot caustic solutions present a most serious potential from splash which may cause serious eye and face injury.

It should be mandatory that glove and eye protection be worn at all times when work is at or near a hot alkali cleaning tank.

In some instances, nasal hemorrhages have resulted due to excessive alkali mist dispersion to the breathing

* Threshold Limit Values for 1958—American Conference of Governmental Industrial Hygienists.

zone. This is another reason why these tanks should be provided with more than normal exhaust.*

In any area where acid or alkali solutions are used, an emergency eye-wash fountain and deluge type overhead shower unit should be provided. One type of shower unit is provided with an inclined floor treadle which automatically opens a water valve as soon as the pressure of the operator's foot actuates the treadle. With the usual pull-chain type of valve control, this chain should be looped to a point about 36 inches from the floor and attached to an 8- or 10-inch dia ring which should be chained to the adjacent wall or supporting column. In this manner, no matter how the chain is hit, it will always be in place for further contact by the individual, who in an emergency is not capable of seeing anything. A copious quantity of water, immediately after eyes or face have been exposed, is the most essential protection to prevent the loss of an eye.

Plating Room Exposures

Aside from exposure at chrome plating tanks and the potentiality when hydrofluoric acid is used, the main cause for concern in plating rooms is the serious exposure of hands, face and eyes to acids and alkalis. These exposures and preventive recommendations are detailed under *Acids or Hot Alkaline Solutions for Metal Cleaning.* Fundamentally, there need be no cause for serious trouble in any plating room provided proper supervision is continuously exercised and normal precautions are followed.

1. Modern chrome plating tank equipment is usually provided with well-designed slot exhaust jackets along both long sides of the tank. Poor exhaust permits excessive chrome mist dispersion to the breathing zone which may result in a perforated septum. Gauntlet type rubber gloves are required to be worn at chrome plating tank units. Immersion of the hands in the chrome solution or contact with the wet plating racks will result in deep-rooted painful sores which require long periods to heal.

2. Nickel plating solutions also produce a condition or dermatitis characterized as "nickel itch." Again, there is no necessity for skin contact with any solution provided proper glove protection is provided and worn.

3. Copper, zinc, tin and cadmium plating do not present any special hazards.

4. Cadmium plated parts do present a special hazard when these parts are repaired or assembled, utilizing a gas or arc welding torch. The heat of the torch volatilizes the metallic cadmium, producing a reddish-brown fume of cadmium oxide. When inhaled this fume attacks and destroys lung tissue, similar to that experienced when oxides of nitrogen are inhaled. Through a physiological response, body fluids come to the aid of the injured tissues, incidentally filling the air sacs of the lung tissues with liquid. Depending upon the length and intensity of the exposure, deaths have resulted from this type of normal industrial exposure.

In one organization, driving gears of small cadmium plating barrels had been removed annually during the two-week summer shut down period. The cadmium accumulations had normally been removed by chipping with a hammer and chisel. A young plant assistant, noting this "horse and buggy" procedure, suggested the use of a nearby oxyacetylene torch. This was used for about 15 minutes. The result was a death four days later.

5. Hydrofluoric acid tank units require special heavy wood enclosures which are normally covered with acid-resistant or asphaltum paints. A separate ventilating unit is usually provided so as not to corrode the main exhaust system.

6. Cyanide solutions present another special hazard. Free cyanide gas is not evolved during process operations. However, processed parts from a cyanide bath, immersed into an adjacent acid cleaning tank previous to proper rinsing, will result in the release of free cyanide to the breathing zone. Cyanide salts or "eggs" used to maintain solution strength, should be kept in a locked area and only dispensed by someone in authority such as a chemist or plating room foreman. The serious potentiality of the use of cyanide salts or "eggs" if stored in an open plant area, relates to suicidal attempts, or the accidental contamination of food resulting from fingers which have been in contact with these materials.

Welding, Brazing and Soldering

Passing reference is made to these operations only as a cross-reference to *Chlorinated Solvents Used for Metal Cleaning* where the possibilities of vapor dissociation are present.

Production or repair operations involving a torch and cadmium plated metal are mentioned under (4) of the previous section.

Normal welding procedures involving bare welding rods do not present any specific health hazards unless lead-base paint or galvanized coatings had been previously applied to the processed parts. There is then the exposure to volatilized lead and zinc resulting in the potentiality, due to inhalation, of lead absorption and the condition characterized as "zinc shakes" similar to exposure in brass foundry operations.

Electric arc welding operations utilizing various types of coated welding rods, do create exposure to ozone, ultra-violet and infra-red emanations. Protection of the welder is usually adequate, but there is the ever-present exposure to adjacent welders or to unauthorized personnel who always seem to be fascinated by a welding operation.

Though the material covered in this section may not be considered a chemical exposure, it is included, since oxyacetylene gas or arc welding is usually performed in practically every industrial organization.

Spray Coating, Dipping and Roller-Coating

The main item of interest relative to these industrial operations is not the toxicity of the materials in use, but the serious potential fire hazards involved. These hazards will be presented in greater detail under *Fire and Explosion Hazards.*

Spray Coating. When spraying operations were introduced many years ago, lead-base paints were mainly used. Today there is no lead in any of the lacquer or synthetic formulations, thus eliminating the previous serious potentiality of lead absorption from the dispersed spray in a booth. Inhalation of the solvents, diluents or thinners used in modern spraying materials present only a moderate health exposure, which may result in headaches or gastro-intestinal

* Postman, B. F., et al, Effective Exhaust for Tanks, Heating and Ventilating, January, 1947.

upsets. However, a modern dry type or water-curtain type of spray booth, provided with sufficient exhaust to create a minimum velocity of 150 fpm across the entire front opening of the booth, usually eliminates the operator exposure to any mist inhalation. Personal protection may be provided by chemical-cartridge or supplied-air respiratory equipment, approved by the U. S. Bureau of Mines. Use of respiratory protection of any type for 7 or 8 hours daily presents a serious supervisory problem. Where spraying must be done inside of enclosures such as large cabinets, refrigerators or similar type equipment, respiratory protection is definitely necessary due to the rebound of the released spray back to the breathing zone of the operator. Exposure to excessive overspray and entrained solvent vapors may be due to:

1. Excessive air pressure at the spray gun is always a debatable subject with foreman and particularly operators. Close cooperation with the technical representatives of suppliers of the spraying stock, plus a moderate amount of experimentation, will soon determine if or how much the air pressure may be reduced. Incidentally, a reduction in air pressure and air volume is an economic approach, since it does cost money to compress air.
2. The spray gun orifice or nozzle opening may be too large permitting unnecessary spraying stock to be used, again resulting in excessive overspray and the release of the irritating solvent vapors. This problem is closely related to (1) and should be carefully studied.
3. Poor operator technique may be another unrecognized item of excessive overspray and solvent vapor dispersion. Again, the opinions and instructional aids of the technical representatives of the organizations who supply the spraying stock are usually available and should be utilized to the fullest extent.
4. Insufficient exhaust at the booth face may be the cause of all of the trouble. In older booth installations, this is usually the trouble, since experience has demonstrated that fans of small air handling capacity, operating against low resistance pressures, coupled with small motors and the usual slippage of V-belt drives, add to the woes of a poor installation. Direct-connected propeller-type exhaust fans provided with a fully enclosed non-explosion-proof motor (unusual installation) is not recommended by Fire Underwriters. The standard installation is an aluminum-alloy propeller wheel operated by a V-belt drive which is enclosed in a tight housing, the motor being located on the outside of the exhaust stack.
5. The presence of overspray and solvent vapor in a spray booth may also be caused by excessive overspray deposits in the exhaust stack, causing increased resistance to the air flow through the stack, at elbows, (the number of which should always be minimized or eliminated entirely) plugged filter units at the rear of the booth, a usual condition due to the neglect of a proper preventive maintenance program, or a weather cap set too close to the exhaust stack outlet, acting as a retarding damper to the air flow from the stack.

Dipping. Depending upon the size of the items processed and the tank required for dipping purposes, there is only a moderate health exposure to inhalation of the solvent vapors released as a result of the normal vapor evaporation from the surface of the stock in the tank. Even with the use of an overhead conveyor system for travel through the dip tank and drip area, metal housings are usually provided as complete enclosures. These are also provided with mechanical exhaust, with discharge to the outdoors, as a flash-fire preventive precaution. Fire protection within the enclosure is provided through the medium of automatically operated discharge nozzles utilizing carbon dioxide gas, foam, or dry chemicals. Three additional problems are always present with dip tank installations, that is, poor housekeeping involving the uncontrolled storage and disposal of used wiping rags, spillage drippage of stock from processed parts and the potentiality of dermatitis due to contact with thinners or diluents. The use of solvents as diluents or thinners, through piping systems or from 55 gal drums, presents potential fire and explosion hazards. These will be discussed in detail under "Fire and Explosion Hazards," Part 2, next month.

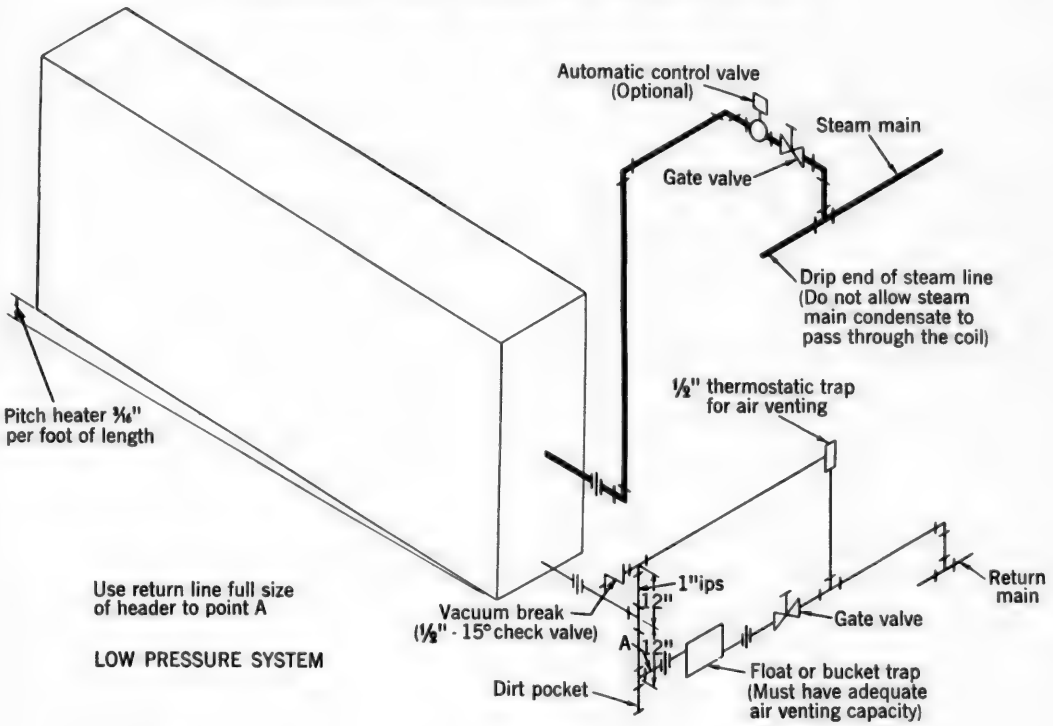
Roller Coating. The potential moderate health and fire hazards connected with this operation are considerably reduced due to the decreased fluid stock area, which means less area for solvent evaporation. This may be offset somewhat by the increased flat area of the processed parts which provide evaporation surfaces for the coating stock, particularly during the normal air-drying cycle. Foreman supervision, preliminary and periodic indoctrination of employees, plus the explanations relative to the causes and end results of spontaneous flash fires and explosions should always be stressed. Good housekeeping is a basic necessity for safe operational procedures.

Coating, Printing or Combining Textiles and Synthetic Fabrics

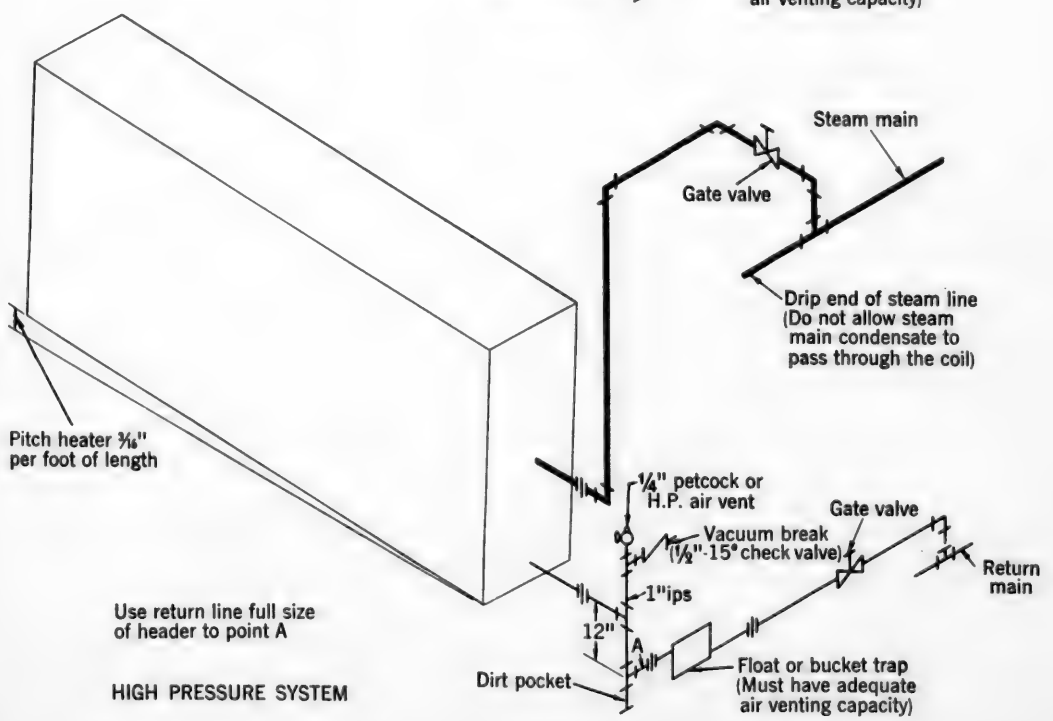
There is only a moderate inhalation exposure present in all of these operations, particularly between the spreading or "doctor" knife where the coating stock is applied to the width of stock processed, and the printing rolls and ink wells, to the point where the coated or printed stock enters the drying or curing oven or chamber. From there on, within the drying area, the most serious potentiality is an explosion. Reduced exhaust fan capacity due to belt slippage, the unknown closing of dampers, dryer operation without the exhaust fans in operation, lack of adequate exhaust provided in the initial design, a change in type or quantity of solvents used as diluents or thinners, a change in the type of coating stock due possibly to a change in cost or type of stock being printed or coated, all add up to causes which are responsible for some disastrous explosions, involving not only buildings and equipment but also personnel. Mandatory requirements of Fire Underwriters demand that the concentration of flammable solvent vapor in the vapor-air mixture does not exceed 20 to 25% of the lower explosive limit of the main or most explosive solvent used in the coating or printing formulation. *This safe operating procedure can and must be maintained at all times.*

HOOKUPS FOR STEAM HEATING COILS

Horizontal Tubes Installed in a Single Section



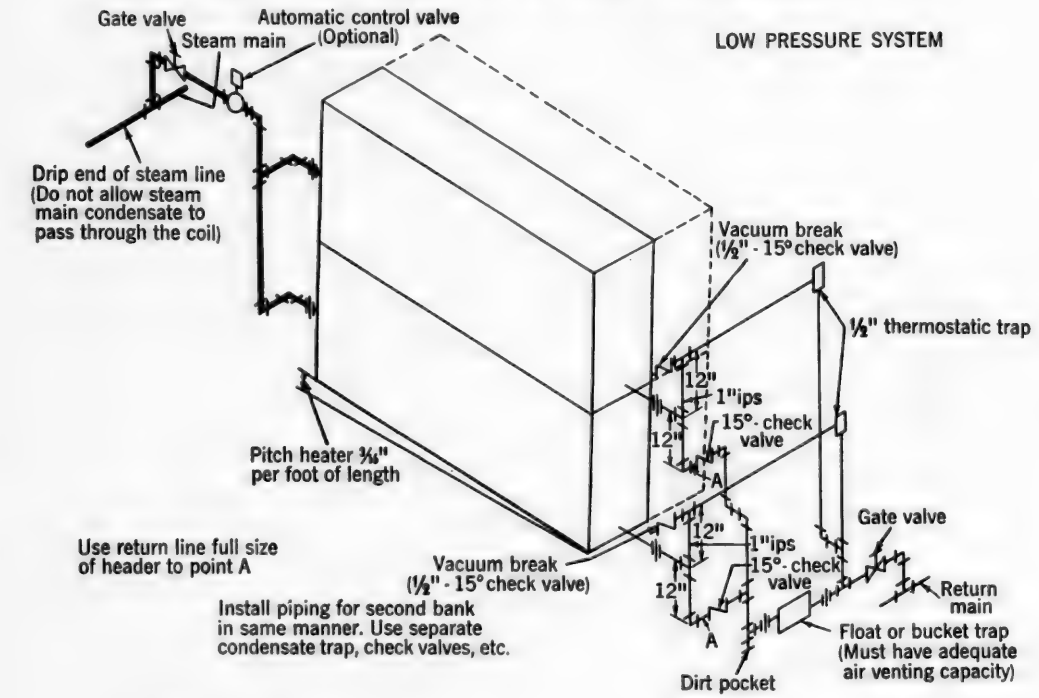
LOW PRESSURE SYSTEM

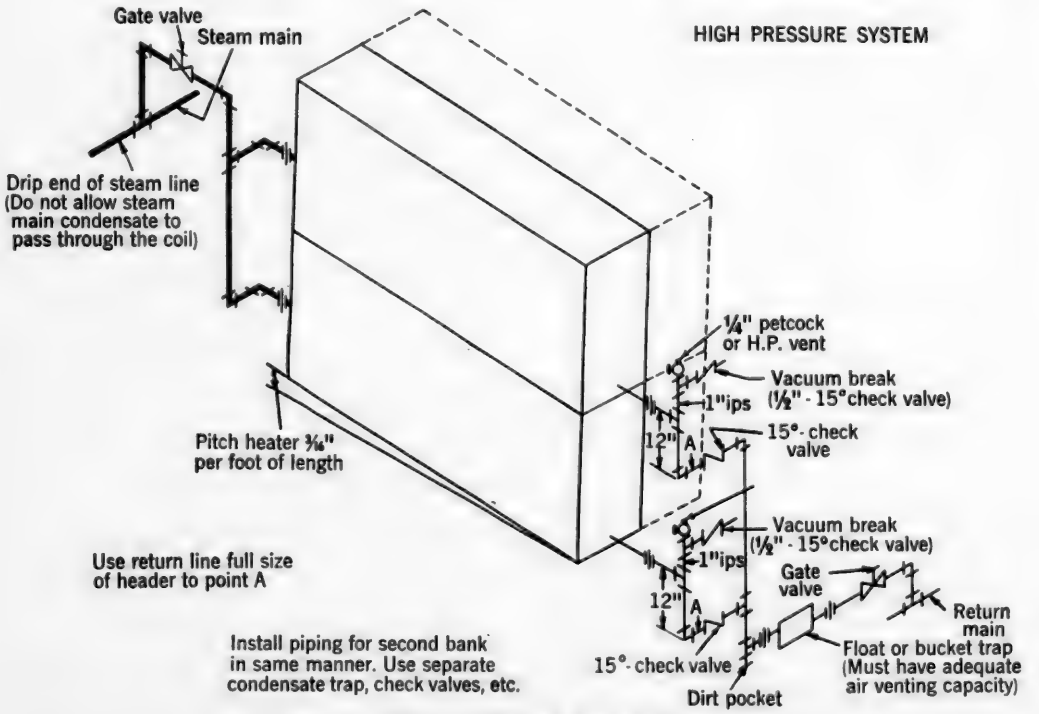


HIGH PRESSURE SYSTEM

HOOKUPS FOR STEAM HEATING COILS

Horizontal Tubes Installed in Two or More Sections


Gate valve
Steam main
Automatic control valve (Optional)
LOW PRESSURE SYSTEM
Drip end of steam line (Do not allow steam main condensate to pass through the coil)
Vacuum break (½" - 15° check valve)
½" thermostatic trap
12"
1"ips
15°- check valve
12"
A
Pitch heater ⅛" per foot of length
Gate valve
12"
1"ips
15°- check valve
12"
Return main
Use return line full size of header to point A
Vacuum break (½" - 15° check valve)
Install piping for second bank in same manner. Use separate condensate trap, check valves, etc.
A
Float or bucket trap (Must have adequate air venting capacity)
Dirt pocket


Gate valve
Steam main
HIGH PRESSURE SYSTEM
Drip end of steam line (Do not allow steam main condensate to pass through the coil)
¼" petcock or H.P. vent
Vacuum break (½" - 15° check valve)
1"ips
12"
A
15°- check valve
Pitch heater ⅛" per foot of length
Vacuum break (½" - 15° check valve)
1"ips
Gate valve
12"
A
Return main
Use return line full size of header to point A
Install piping for second bank in same manner. Use separate condensate trap, check valves, etc.
15°- check valve
Float or bucket trap (Must have adequate air venting capacity)
Dirt pocket

Drawings on This and Reverse Side
Courtesy of Sturtevant Division, Westinghouse Electric Corp., Boston, Mass.

SOUND CONTROL

in Air Conditioning Systems

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Although much research is still required in the field of sound control, this article presents the basic formulas and data, and covers design considerations for controlling sound at various points in an air conditioning system.

NOISE or sound is all around us. As the size, power and number of mechanical devices that surround us increase, the noise bath in which we are submerged becomes louder and louder. Those involved in design and installation of sources of potential noise need to become more aware of sound. It is best to meet the problem head on before an aroused public bases its decision to buy on how well the manufacturer and contractor have been able to control sounds. To do this effectively, it is necessary to know the way the sound is generated, how it is transmitted, and how to control it so that the resulting and often inevitable sound levels will be tolerated.

Making things completely quiet may not always be the ideal solution to a sound problem. Consider first what can be one of the most critical design objectives in air conditioning—a comfortable sleeping environment. In this category are home bedrooms, hospital rooms, hotel and motel rooms and apartments. In some of these spaces it may not be desirable to make the equipment sound level as low as possible; for example, in a hotel room downtown in a large city the sound level should be made low enough so that it will be easy to sleep, but still loud enough to mask out the intermittent noises of traffic; in a motel, highway traffic noise should be masked out; and in a hospital, night noises in the hallways should be masked to provide a pleasant sleeping environment for the patients. In the country, a quiet suburban town, or a rural area away from all sources of common sounds, a very low level should be maintained because the residents are accustomed to low sound levels and there are no undesirable noises to be masked.

Easy listening conditions might be the next most critical sound consideration. Spaces which require this condition are auditoriums, theatres, conference rooms, concert halls and offices. In each of these spaces, it is desirable to have low sound levels at all times so that it is not difficult to listen or carry on a conversation. In a small office, a sound level higher than that in an auditorium could be tolerated since the sound could be used to mask other sounds coming from outer offices and yet be low enough to provide easy listening within the office for a limited number of people sitting fairly close together.

For pleasant working conditions in large offices a sound level higher than that for the two preceding situations can be permitted. Ideally, in a general office, each desk should be acoustically isolated from all the others through the use of controlled sound. However, the sound level must not be so high that conversation cannot be carried on easily at the desk or that it becomes difficult to talk on the telephone.

Each of the preceding environments provided areas for listening, conversing or living. Two additional steps exist on the scale of noise levels; one of these is

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simply a noisy area where it is difficult to converse, and the other area is one where it is noisy and there is the possibility of loss of hearing due to the high sound level. It is rare that an air conditioning equipment operator will be subjected to sound levels which are high enough to endanger hearing so this will not be discussed further.

In an equipment room where the sound level is high, the sound is usually radiated by pumps, compressors and fans. Generally speaking the sound level of a machinery room is not important in itself so long as the sound is not transmitted to other parts of the building, and there is no danger of hearing loss. In special cases where the machinery room is to be used as a show place, all the sound sources must be considered in obtaining the desired sound level.

Public Made Aware of Problem

Public awareness of sound has been fostered by a number of things. In almost any publication one can find advertisements containing references to "quiet operation" of the particular product. Various popular, technical and non-technical publications carry articles on sound, and there is one publication which is devoted exclusively to semi-technical articles on sound and its control.[1]

These sources mentioning sound probably do not attract as much attention as court cases, which develop over noise and are publicized in newspapers. They concern requests for payment under Workman's Compensation Laws for loss of hearing, aircraft operations, air conditioning equipment (individual units such as room air conditioners or associated equipment, such as cooling towers), building construction processes such as riveting, and even such innocuous things as household pets.

Differing slightly from problems mentioned are zoning ordinances that specify acceptable sound levels at the property line of various industries. Such an ordinance in Chicago limits the sound level of new industry. Ordinances of this type, drawn with care and the aid of acoustical specialists, will go far in heading off troublesome community problems.

Sounds in Air Conditioning

To understand that sound energy flow does not differ greatly in principle from the flow of heat energy in a building, consider the following analogy. In almost any building there are a number of sources of heat. These may be radiation from the sun, people, lights, radiators and even an adjacent room, such as a hot kitchen. This heat energy travels through the walls, windows and air into the room in which the temperature is to be controlled. When designing the air conditioning system, each of these influences must be carefully considered to assure that the people receiving the energy will be comfortable. See Fig. 1.

Now consider a room with sound energy flowing into it. Naturally, there are many sources of sound, each radiating a certain amount of energy, but for the analogy, sounds entering the space originate principally with fans, compressors, grilles, machines, traffic and people. And, as in the case of heat flow, this energy flows through walls, windows, duct openings, doors and the air. Again, there must be some type of receiver—people—or the sound would exist without its being heard. To plan for proper treatment of the sound, a design criterion must be established for the space, and then each of the energy flows into the space must be considered and treated.

To carry the analogy further, the heat flow into the room from the kitchen might be controlled through the use of insulation or by cooling the kitchen. Acoustically, the sound energy flow might be reduced by use of absorbing material or by increasing the thickness of the wall between the spaces. In the ventilating system too much heat or cooling in the duct to the room would be controlled by changing the temperature of a coil in the duct; acoustically, if too much energy reached the room through the ventilating system, some of the energy would be absorbed by some type of muffling device.

TERMINOLOGY

For discussing sound in central station air conditioning, we will need to discuss some acoustical terminology and a little background.

Noise. This is a word which is used and misused by many people. According to the definition adapted by the American Standards Association, noise is unwanted sound. This means that what may be music to one man may be noise to another.

Sound Pressure. This is the incremental effective (root-mean-square) pressure at a point caused by the passage of the sound wave. This effective pressure is analogous to the effective voltage of the common AC electrical systems, which is 110 volts. The instantaneous voltage actually varies from about plus 160 to minus 160 volts, and the 110 represents the root-mean-square value of this instantaneous voltage.

In the foregoing analogy of heat and sound, the comfort criterion is established on the basis of the temperature which is to be maintained in the room; for the acoustical criterion it is sound pressure which establishes the criterion, thus temperature is considered analogous to sound pressure.

Sound Power. This is defined as the power, expressed in watts, which is radiated by an acoustic source. This power is no different from that found in electrical work, but the range of power encountered in acoustics is much greater. A turbojet, for example, radiates about 50,000 watts; a 13,000 cfm centrifugal type fan about 0.05 watts; and the human voice in a very soft whisper radiates about 0.000,000,001 watt. The sound power radiated by mechanical equipment generally represents only a small fraction of a per cent of the total power input to the machine.

Decibel. The decibel, a dimensionless unit, is simply

[1] Noise Control, published by American Institute of Physics for the Acoustical Society of America, New York, N. Y.

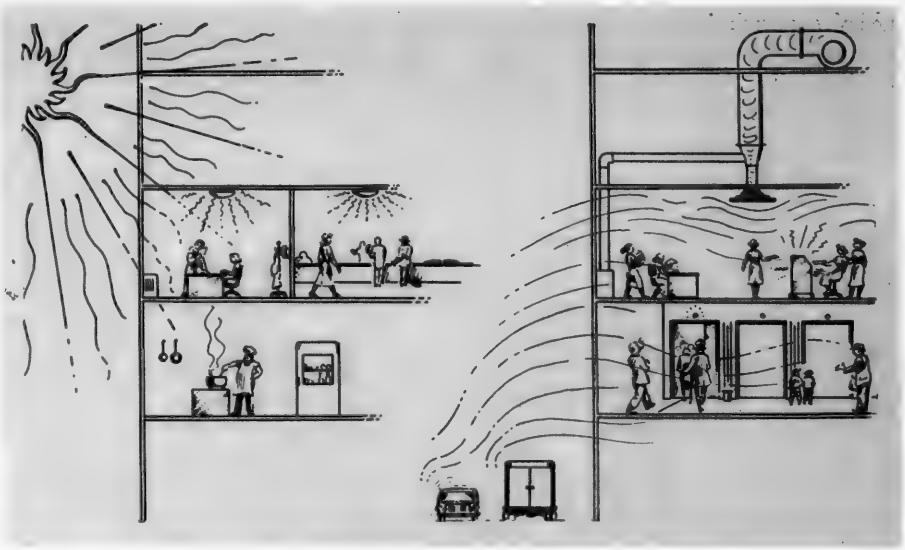


Fig. 1. The secretary in the office, left, is subjected to heat flowing from many sources around her. The secretary in the office at right is surrounded by sound energy.

the ratio of two numbers expressed on a logarithmic scale. Generally speaking, the numbers are electric or acoustic powers. Thus, if the two numerical values are W_1 and W_2, their ratio in decibels is

$$A = 10 \log_{10} \frac{W_1}{W_2} \text{ db}$$

Sound Power Level. Sound power level in decibels is defined as:

$$L_w = 10 \log_{10} \frac{W_1}{W_0} \text{ db}$$

where W_1 is the power in watts of an acoustic source, the W_0 is the reference power. The reference power which is most commonly used today is 10^{-13} watt. Thus, when a source of acoustic power radiates one watt, it has a sound power level of 130 decibels referred to 10^{-13} watt.

When two acoustic sources are rated in decibels referred to 10^{-13} watt, it is possible to compare them directly and say that one source radiates more power than the other. If, however, ratings are given with two different references, it is necessary to convert the ratings to the same reference or into watts before they can be compared.

TABLE I—DECIBEL VALUES

Pressure Ratio	Decibels	Power or Area Ratio
1.0	0	1.0
1.122	1	1.259
1.259	2	1.585
1.413	3	1.995
1.585	4	2.512
1.778	5	3.162
1.995	6	3.981
2.239	7	5.012
2.512	8	6.310
2.818	9	7.943
3.162	10	10
5.623	15	31.62
10	20	100
31.62	30	1000
100	40	10000

It is important at all times to state what the reference is when giving levels in decibels.

Sound Pressure Level and Sound Level. When a sound wave travels in free space, it is possible to state that $W = P^2/Z$ where W is sound power, P is the sound pressure, and Z is the acoustic impedance of the air. Under these conditions, it is possible to write

$$A = 10 \log_{10} \frac{P_1^2/Z_1}{P_2^2/Z_2} \text{ db}$$

or if $Z_1 = Z_2$

$$A = 10 \log_{10} \frac{P_1^2}{P_2^2} \text{ db}$$

Since sound pressure is the easiest quantity to measure, the sound pressure level is often defined as

$$L_p = 20 \log_{10} \frac{P_1}{P_0} \text{ db}$$

even though in many cases Z_1 is not equal to Z_2. P_1 is the effective sound pressure in dynes per square centimeter, and P_0 is the reference sound pressure of 0.0002 dyne per square centimeter. One dyne per square centimeter is approximately one millionth of an atmosphere. Table I shows the various decibel values corresponding to various pressure and power or area ratios. It should be noted that for each decibel value the power ratio is the square of the corresponding pressure ratio.

Sound level is the reading taken on a sound level meter conforming to American Standards for sound level meters when either of the two frequency weighting networks is employed. These networks are intended to simulate approximately the response of the ear at different levels.

Frequency and Octave Bands. Frequency is defined as the repetition rate of a periodic disturbance. Because of the wide range of frequencies in noise control (the human ear in the young adult has a range of sensitivity which extends from 20 to 20,000 cycles per second), it is not convenient or practical to consider each individual frequency. What is customarily done is to divide the fre-

quency spectrum into a number of bands. The most commonly known of these bands is the octave, which is a band of frequencies where the upper frequency is twice the lower frequency. The most common frequency analyzers and those that meet American Standards for

Room Constant. The room constant R, which is a measure of the effective absorption of a room, is defined as

$$R = \frac{S\alpha}{1-\alpha}$$

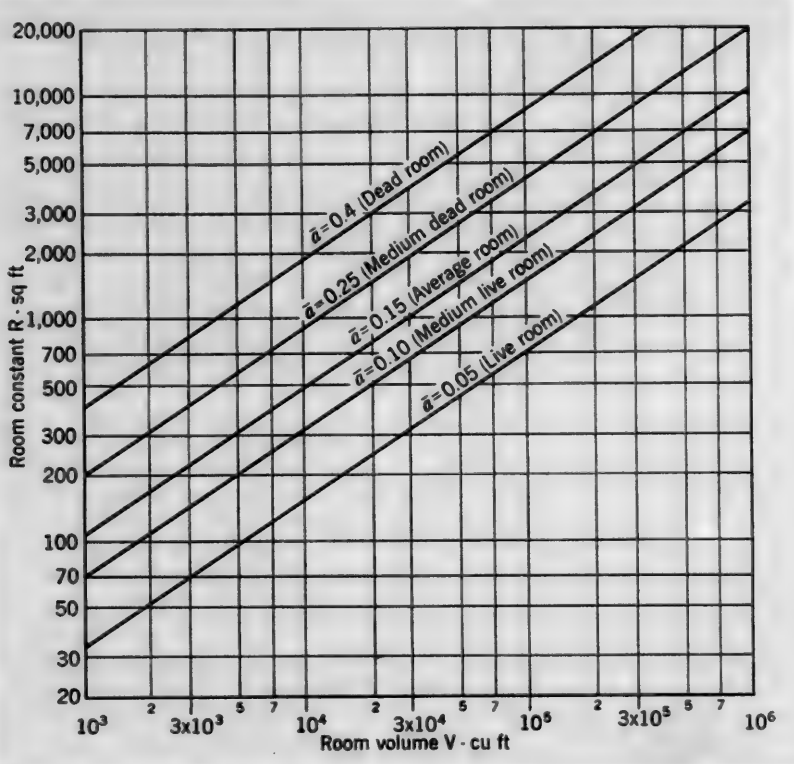


Fig. 2. Value of room constant R for various degrees of room sound absorption as a function of room volume, for a room with proportions about 1:1.5:2. Reprinted by permission from Acoustics by L. L. Beranek (McGraw-Hill Book Co.)

octave band analyzers use eight octave bands where the lowest band extends from 20 to 75 cycles per second; the upper band from 4800 to 10,000 cycles per second. The six bands between these two extremes are each an octave wide. Most analyzers do not extend beyond 10,000 cycles per second because this area is not considered important in the average noise control work as very few sources radiate much energy in that range.

It has been common practice to rate equipment using the sound level measured on the *A*-scale or 40 db network of a sound level meter with the microphone at a specified distance from the sound source. This is far from the ideal way of providing an acoustical rating since it does not give any information regarding the frequency characteristics of the sound source under test. For engineering purposes in sound control, it is necessary to know the sound power level or the sound pressure level under certain specified test conditions as a function of frequency. If one gives only the overall sound power level of an acoustic source, it is analogous to specifying the latitude of a certain location on the earth without giving the longitude.

Noise Reduction. Noise reduction is the difference in decibels between the sound pressure levels at two points along an acoustic path away from the source.

where S is the surface area of the room in square feet, and $\bar{\alpha}$ is the average sound absorption coefficient of the room. The average sound absorption coefficient is calculated from the following equation

$$\alpha = \frac{S_1\alpha_1 + S_2\alpha_2 + \ldots}{S_1 + S_2 + \ldots}$$

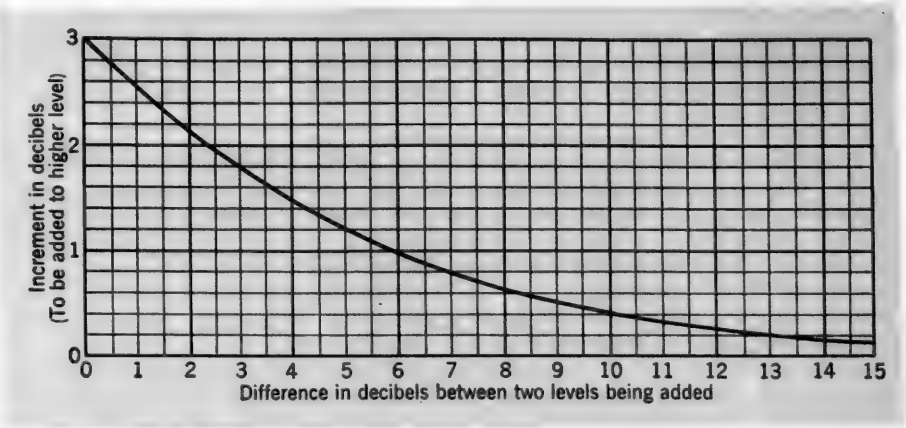
where the subscripts refer to the various types of surface areas in the room and their respective sound absorption coefficients α_1, α_2, . . ., the absorption coefficient of each type material. The sound absorption coefficients for various materials may be found in references[2,3]. For an approximation of the room constant, Fig. 2 may be used.

Transmission Loss. This term which is common in architectural acoustics is defined as 10 times the logarithm to the base 10 of the ratio of the power incident on a wall to the power transmitted through the wall. The unit is the decibel. Usually, the transmission loss or *TL* is published for the frequencies 125, 250, 500, 1000, 2000, and 4000 cycles per second. Values of the transmission

[2] Knudsen, V. O. and Harris, C. M., Acoustical Designing in Architecture, John Wiley & Sons, Inc., New York, 1950.

[3] Sound Absorption Coefficients of Architectural Acoustical Materials, Acoustical Materials Assn., New York, N. Y.

Fig. 3. Chart for combining decibels.


Increment in decibels
(To be added to higher level)
0
1
2
3
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Difference in decibels between two levels being added

loss of many wall structures are given in several publications[4,5,6].

Manipulation of Ratios Expressed in Decibels. One of the most perplexing problems in working with levels in decibels or noise reduction in decibels are the methods of combining them. The best way to illustrate the methods of combination is through the introduction of an example.

Consider two sources of power, each having an output of 10 watts. In addition, there is an attenuator which will pass ¼ of the energy entering it. If the two sources of power are connected together 20 watts of power can flow into the attenuator. Since only ¼ of the power flows out, 5 watts will be left.

If this is expressed in logarithmic terms or decibels, it is necessary to have a reference power. For the purpose of this example one watt will be considered as the reference power. Then each of the sources has a power level of 10 db referred to 1 watt. (See Table 1 for power ratio of 10)

The reduction provided by the attenuator is ten times logarithm to the base ten of the ratio of the power in to the power out which is 6 db. (See Table I for power ratio of 4)

To obtain the power level out of the attenuator the power level of the sources are combined through the use of Fig. 3 to obtain 13 decibels. (Note that the antilog of 13 db re 1 watt is 20 watts). The reduction provided by the attenuator is then subtracted from this to obtain 7 decibels, and the antilog of 7 db referred to 1 watt is 5 watts. Thus, in arithmetic manipulation, the reduction is multiplied, and in logarithmic manipulation, or decibels, it is added or subtracted which is in accordance with the rules of logarithmic manipulation.

SOUND SOURCES

In central station air conditioning equipment there are many sources of sound, each of which must be individually considered and treated. The fan is a primary contributor. It obviously puts sound energy into the duct system as it moves the air, and this energy is transmitted down the ducts. In addition, the fan casing radiates energy into the surrounding space. It can also transfer energy to the building structure by vibration which can become sound if the energy is transmitted to a panel (floor or wall) that can be set in motion and thereby radiate sound.

Machines and Pumps

Pumps associated with refrigerating machinery and cooling towers are another source. In a manner similar to the fan, sound energy is transmitted along pipes instead of ducts, radiated into surrounding space and transmitted to the building framework.

The refrigerating machine generally transmits sound energy in only two ways: Into the machinery room and into the building. A small amount of energy may, however, be passed along connective piping. In some respects refrigeration units may present a greater problem than either fans or pumps. Machinery which has a low rotative speed is quite often not exceptionally well balanced and as a result will transmit large forces to its foundation; reciprocating machinery also presents a problem because of the impulsive nature of the gas discharge from the cylinders. High speed rotative machinery is generally quite well balanced and does not have large forces transmitted to its base.

The cooling tower is similar to the cooling machinery in that it transmits energy in two directions—into free space and then to the neighbors, and into the building. The most important of these two is the energy radiated into the surrounding air. Cooling tower noise has been the cause of restriction of the operation of air conditioning equipment in a number of instances, and in one particular case, forced the shutdown of the air conditioning equipment in a new hotel every night at 10:30 after only one full night of operation.

Air Distribution Devices

All of the air distribution terminal devices such as diffusers, grilles, induction units, fan-coil apparatus and any device causing a pressure drop, must be considered as sound generating sources. This equipment provides very little opportunity for direct sound control by the consulting engineer. What he must then do is establish specifications for the acoustical output or reduction provided by the terminal unit which will meet his acoustical design criteria. It is the manufacturer's responsibility to control the design and manufacture of his equipment so

[4] Sound Insulation of Wall and Floor Construction, Building Materials and Structures Report 144, *National Bureau of Standards*, Feb. 25, 1955.

[5] Sound Insulation of Wall, Floor and Door Constructions, Supplement to Building Materials and Structure Report 144, *National Bureau of Standards*, Feb. 27, 1956.

[6] Sound Reduction Properties of Concrete Masonry Walls, National Concrete Masonry Assn., Chicago, Ill.

that the sound output for standard operating conditions will meet the specifications. The consulting engineer will be guided in his establishment of acoustical specifications by manufacturers' published data which can be used to select units whose acoustical qualities will blend in with other factors to produce a satisfactory acoustical design.

In making the proper selection, the engineer may find in a system design that a unit is mechanically satisfactory, but it has too high a sound level. It may then be necessary to select a larger unit and operate it below normal rated capacity to reduce the sound level, select several smaller units, or select a different design of unit. If several smaller units are selected, their combined noise level should not exceed that of the single unit initially selected.

DESIGN STEPS

Satisfactory air conditioning systems which have been installed with reasonable care according to the specifications, can still cause customer complaints. The cause, suggested by the owner as mechanical malfunction or faulty installation of the equipment, may actually be traced to insufficient consideration given to sound control during the design stages of the building itself.

The first step in any acoustical design of an air conditioning system is to be certain that noise problems have not been designed into the building. For example, the space allowed for the machine room may be located over a conference room or private offices, which simply invites a sound problem. If possible, it should be suggested to the building designer that potential sound sources be located where they will be well isolated from critical areas by non-critical areas. If this is impossible, then plan for isolation of sound and vibration sources by resilient mountings, separate steel foundations or foundations on glass fiber.

A second reason for giving thought to acoustical design and equipment selection at the time the air conditioning system is laid out is to be assured that the equipment specifications the suppliers are expected to meet are realistic. Unnecessary expense results if air conditioning equipment for a private office is specified for a space located at street level with glass wall construction on a busy

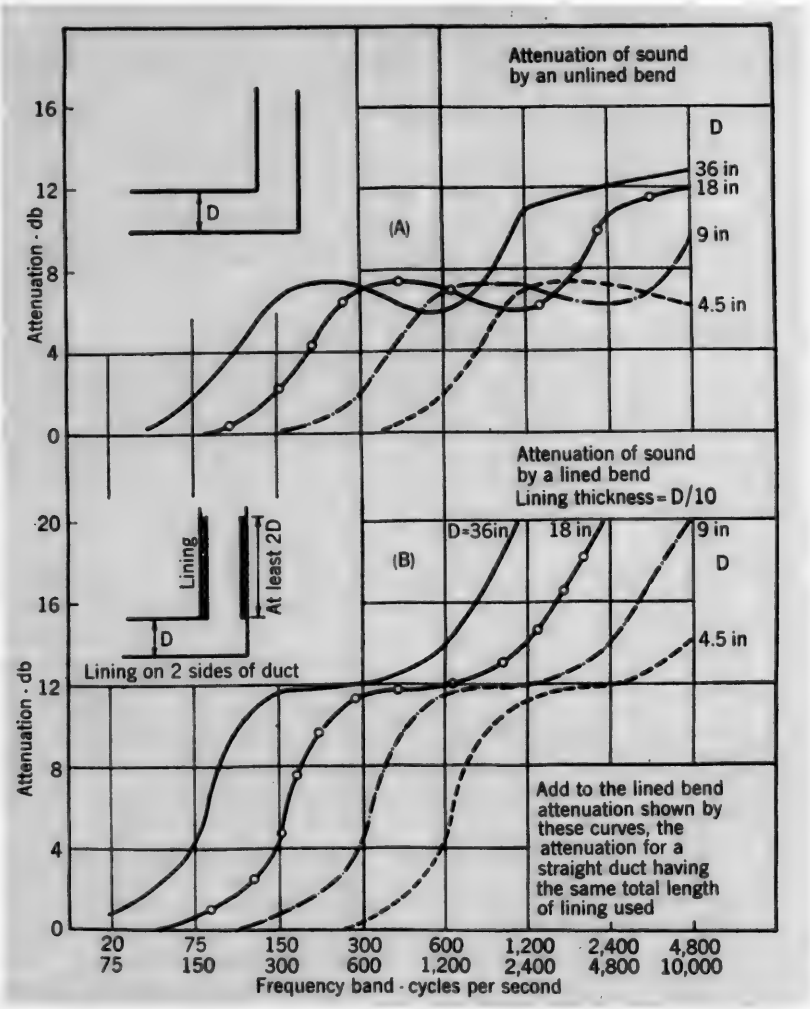


Fig. 4. Noise reduction provided by lined and unlined elbows in a duct having a cross dimension D. This and Fig. 6 are reprinted by permission from Heating Ventilating Air Conditioning Guide 1958, Chapt. 40.

thoroughfare. A glass wall, or almost any of the modern light weight curtain wall constructions, does not provide the degree of acoustical isolation from exterior noise which might be desired. In addition, to insist that the manufacturer guarantee the end result of a system design is to hold him responsible for the acoustical design of the building over which he has no control. It is not necessary for the consulting engineer to undertake a complete check of the acoustical design for every building, but he should be alert to avoid specifying unrealistic conditions to be met by the manufacturer.

Design Criteria

In any acoustical design, it is the sound pressure level which determines its acceptability. As mentioned earlier, this is analogous to the temperature in the control of comfort in an air conditioned space. However, it is not realistic to state the sound level or sound pressure level in a space shall be so many decibels. The sound pressure level should be stated as a function of frequency, and this is done in the NC criteria developed by Leo L. Beranek[7]. These criteria have received wide-spread publicity as a means of specifying the acoustical conditions in various classes of spaces and were developed by measuring sound pressure levels and determining by questionnaires what was or was not considered acceptable by the occupants of various spaces.

These criteria do not mean that the A-scale sound level on a sound level meter has no use as a criterion. It will probably be used for some time despite the fact that it gives no frequency distribution and therefore does not lend itself to an engineering approach. As a check on the NC criteria, the A-scale sound level appears to be very useful. Generally speaking the A-scale sound level is 5 to 10 db higher than the NC criteria.

When planning an air conditioning system, first establish the criteria for the rooms, or classes of spaces. In general, it is easiest to select the room nearest the fan and aim the design at that room. If this happens to be a noisy area, look further into the system for the room, the criterion of which will govern the design. This is done by determining the noise reduction between the room nearest the fan and the second room selected. If the noise reduction provided by the duct system between the two rooms equals or exceeds the difference in criteria between the two spaces, assuming that the second space has the more stringent criterion, the criterion for the first space is adequate as an objective for the design of the system. If, however, the noise reduction of the duct system between the two rooms is less than the difference in criteria, the second room should serve as the design objective for the system.

Analysis of System

When the criterion has been selected, the air conditioning system can be acoustically analyzed using the following system of five steps:

Step 1. Determine the sound power level of the fan as a function of frequency. This can be obtained either from data which should be supplied by the fan manufacturer or estimated from either of the following two equations:

$$\text{Sound Power Level} = 100 + 10 \log_{10}\text{HP} + 10 \log_{10}\text{P}$$

$$\text{Sound Power Level} = 65 + 10 \log_{10}\text{Q} + 20 \log_{10}\text{P}$$

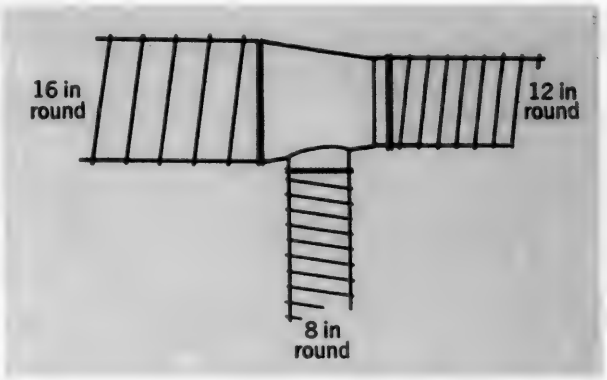


Fig. 5. Configuration of the duct for which the area reductions are calculated.

Sound power level is expressed in decibels referred to 10^{-13} watt.

HP is the nameplate horse power of the fan motor.

P is the pressure across the fan in inches of water.

Q is the air quantity in cubic feet per minute.

This may be taken conservatively as the sound power level in the first octave band (it is actually the overall sound power level, but the error is negligible), with the frequency spectrum of the power level of the fan having a slope of minus 5 db per octave for centrifugal type fans.

At first glance, it may seem these equations do not have the accuracy desired, but a 50% decrease and a 100% increase in the value of most of the variables only makes a 3 db change in the power level. This is well within the limits of the acoustical design; the tolerance on the sound power level equations is $\pm$ 4 db.

Step 2. Subtract from the power level of the fan the noise reduction due to the duct system. This includes losses due to expansions in the duct for coils, elbows, area divisions, and noise reduction due to unlined duct. Losses caused by expanded sections[8] are very helpful in reducing low frequency noise. The larger the area ratio at the expansion, the higher the loss. However, if the duct returns to original size, loss at the frequency at which the length of the expansion is equal to one half wave length will be zero.

A rounded elbow in cylindrical duct does not greatly reduce the noise level of the fan, but a rectangular elbow with small turning vanes can be very useful at high frequencies as shown in Fig. 4. The use of elbows will be discussed in more detail.

Area divisions appear to provide a reduction of sound power proportional to the area (equivalent to the same SPL in both branches). The reduction is generally ten times the logarithm to the base ten of the ratio of the area of the branch duct to the total duct area leaving the junction. The area of the incoming duct is not included in the summation. This is illustrated below with the use of Fig. 5. Since the ducts are round, the areas are proportional to the square of the radii. Thus, the reduction down the 8-inch branch is

[7] Beranek, L. L., Revised Criteria for Noise in Buildings, *Noise Control*, 3, No. 1, p 19, Jan. 1957.

[8] Davis, Jr., D. D., Stokes, G. M., Moore, D., and Stevens, Jr., G. L., Theoretical and Experimental Investigation of Mufflers with Comments on Engine Exhaust Muffler Design, *National Advisory Committee for Aeronautics, Report 1192*, p. 10, p. 29.

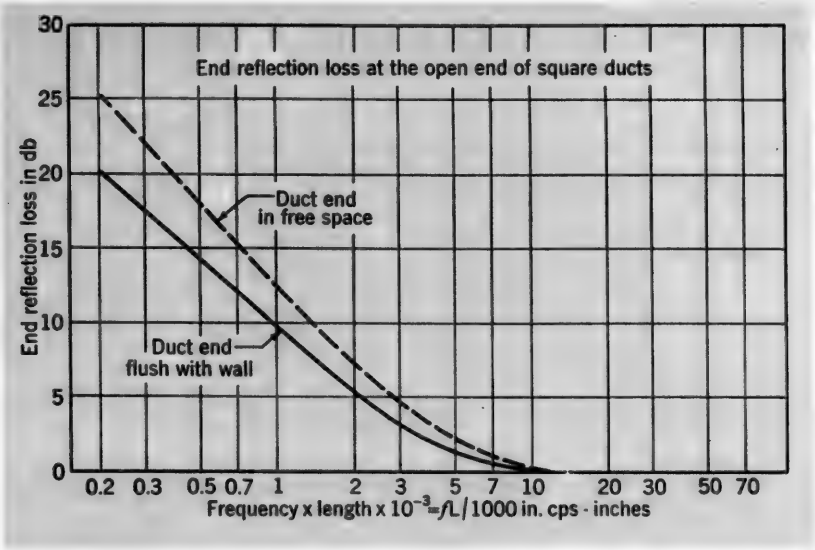

End reflection loss at the open end of square ducts
End reflection loss in db
Duct end in free space
Duct end flush with wall
30
25
20
15
10
5
0
0.2 0.3 0.5 0.7 1 2 3 5 7 10 20 30 50 70
Frequency x length x 10^{-3}=fL/1000 in. cps - inches

Fig. 6. End reflection losses at the open end of a duct of area L^2.

$$10 \log_{10} \frac{16}{36 + 16} = 5 \text{ db}$$

The reduction down the 12-inch branch is

$$10 \log_{10} \frac{36}{16 + 36} = 1.5 \text{ db}$$

Step 3. Additional losses in the duct system occur at the outlets. Termination losses for grills and diffusers, which depend on the diameter of the opening, can be obtained from Fig. 6. The smaller the opening, the higher will be the loss of low frequencies. Losses through induction units, damper boxes and sound reduction boxes should be obtained from the manufacturer. In Fig. 6, f should be the geometric mean frequency of the band.

Step 4. Determine the sound generation of the grilles, diffusers, induction units, or fan-coil units. This data should be obtained from the manufacturer as the sound power level in decibels as a function of frequency. Some already supply this information and others are preparing to do so.

Step 5. When all noise reduction values have been obtained, the sound pressure level in the room can be calculated to see if the criterion has been met. Subtract from the sound power level of the fan all noise reductions due to area divisions, elbows, duct losses, expansions, and termination losses of either a grill or a package unit. This is now the sound power level transmitted from the fan to the room. This can be reduced to sound pressure level by referring to Fig. 7 which is designed for use with terminal units located in a wall or ceiling. The room constant R has been defined earlier.

If the transmitted fan noise exceeds the criterion established for the room, some type of sound absorber is necessary to provide the noise reduction indicated by the difference between the sound pressure level and the criterion curve.

The sound power level of termination units should also be converted to sound pressure level and compared to the criterion. If this exceeds the criterion, it may be necessary to re-select some units or re-design the air distribution network. Ideally the contribution of the fan and terminal unit to the room sound pressure level should be reduced no more than 3 db below the criterion for this will mean that each then contributes equally to the resulting sound pressure level. It may be found, however, that it would be advisable to treat one source more heavily than the other; that must be determined by comparing the sound pressure levels of the two sources and the cost of various means of noise reductions for each. The heavy treatment should not be carried to the extreme; in no case need one source be reduced more than 10 db below the other. This situation would occur only if one sound source met the criterion and the other was easier to reduce.

DESIGN CONSIDERATIONS

The method of controlling the sound of the terminal units has been discussed earlier. To control the flow of sound energy down ducts, sound absorbers are generally used. There are many types each designed or intended for as many different jobs. These range from placing a simple lining on the inside of the duct walls to large special package units. To control the flow of sound energy into the building structure various methods of isolation are used.

Sound Absorbers and Elbows

The theory of sound absorbers is in general fairly well understood. However, the detailed methods are too time-consuming to be of much practical value to even the acoustical engineer. There are some empirical rules though which act as a guide in the design of a sound absorber. The product of the noise reduction A in decibels per foot times d the interior cross dimension of a square duct in feet reaches a maximum for an optionally designed square duct with a thick lining on the walls, of about 12 db (duct lined on all four sides). This is near the frequency where the ratio of d to the wave length of the sound is about equal to one. In other words, a duct with a cross dimension of 2 ft has a maximum reduction of 6 db per foot at 550 cps.

These two parameters indicate that it is difficult to ob-

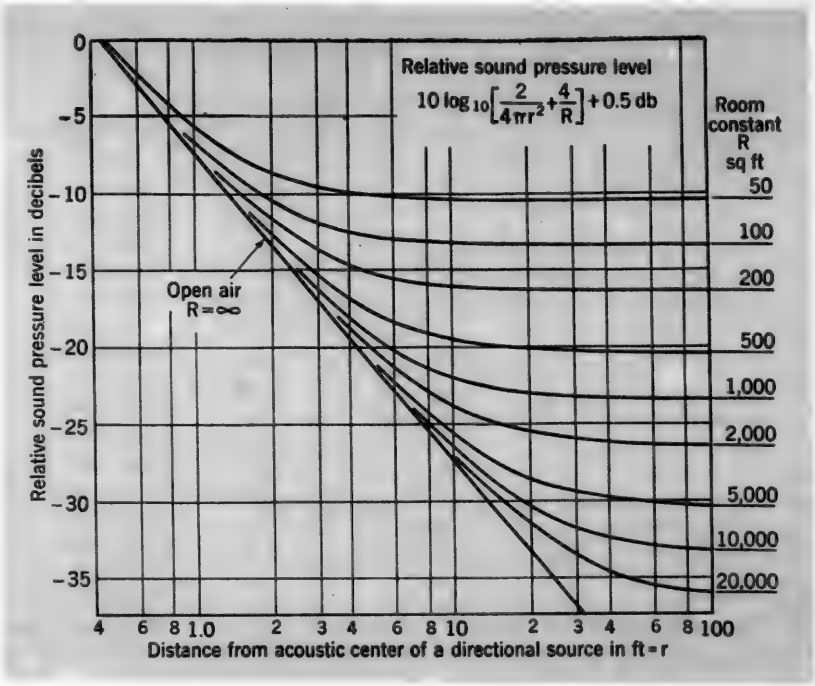


Fig. 7. Curve for determining the sound pressure level in a room relative to the sound power level. This curve applies for the case of a duct flush with the wall.

tain noise reduction at low frequencies in a small duct. The noise reduction at low frequencies may be improved slightly through the use of denser lining materials and increasing the thickness of the treatment. Generally increasing the thickness of the lining will increase the peak value of *Ad*, and increasing the density of the lining will decrease the value of *Ad*, but will broaden the frequency range over which noise reduction can be obtained.

A relatively simple method for the design of sound absorbers has been published in reference[9], but it is necessary to use some data which can be found in reference[10]. This later reference also gives information on the protective facings for glass fiber to prevent its erosion by moving streams of air.

At times it is not convenient to go through the calculations necessary for the design of a sound absorber. It is often much simpler to scale a sound absorber which has already been designed and tested to the needed size. The technique for scaling the size and noise reduction is found in reference[11] along with a discussion of many types of sound absorbers.

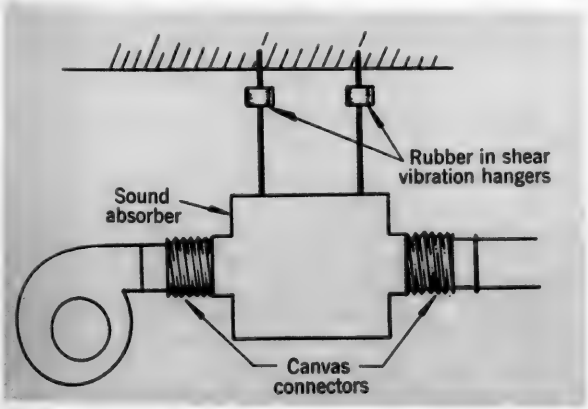


Fig. 8. Method of installing a sound absorber. Canvas connections should be used all the time; vibration hangers in critical applications where a high degree of noise reduction is desired.

In general, a sound absorber which performs well at low frequencies will not perform well at high frequencies. This, however, should present no problem since the high frequencies are easily reduced through use of a square elbows. Such an elbow is very efficient if a lining extends down the duct from the turn, in a direction away from the sound source, for a length equal to twice the cross dimension of the elbow when looking at the side of the elbow, Fig. 4. If turning vanes are used in the elbow, they should be kept as short as possible since the reduction in sound provided by a vaned elbow is reduced from that provided by an unvaned elbow at all frequencies above that at which the length of the vane is equal to about one quarter of a wave length. Also, remember that treatment of a return duct may be more important than a supply duct because of the shorter runs and lack of terminal devices.

The value of any sound absorber is limited by the amount of energy which is transmitted around the sound absorbing section. One of the principle paths for flanking the sound absorber is through the metal of the duct itself. To prevent this flanking path, it is well to place vibration breaks before and after the sound absorber as well as along it, if it is long and a high degree of noise reduction is needed. See Fig. 8. The use of vibration hangers as shown should be considered in those cases where a very critical job is being planned and special precautions are taken to isolate the ductwork following the sound absorber. Figure 19 of reference[11] shows a decrease of 20

[9] Handbook of Acoustic Noise Control, Vol. I, Physical Acoustics, Supplement 1, *Wright Air Development Command Technical Report* 52-204, April 1955. Available from Office of Technical Service, U. S. Department of Commerce, Washington 25, D. C.—Publication No. PB 111 2005.

[10] Labate, S., Acoustical Materials for Noise Control, *Noise Control* 2, No. 1, p. 15, Jan. 1956.

[11] Dyer, I., Noise Attenuation of Dissipative Mufflers, *Noise Control* 2, No. 3, p. 51, May, 1956.

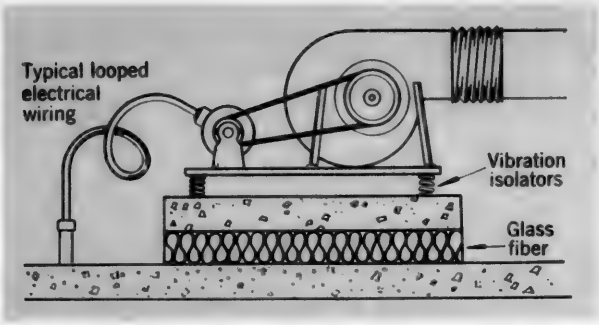


Fig. 9. How machinery is mounted on glass fiber. Looped electrical line and canvas connection are shown to prevent rigid connections of machinery to the building.

db in noise reduction due to a flanking path around a large sound absorber, so when considering a high degree of noise reduction, *don't* forget the importance of the flanking paths.

Machinery Foundations

Sound absorbers are not a panacea for building noise problems. They cannot prevent the transmission of sound energy into the building structure from machinery, but there are three ways in which this can be done: vibration isolators, separate steel structure, and floating the machinery foundation on glass fiber. The use of vibration isolators is quite common, but care must be exercised; in solving vibration problems, it is generally assumed that the floor on which the isolator is located is rigid, and such may not be the case. This is particularly true in modern lightweight buildings. In such a situation, the isolator selected in the normal manner may be unsatisfactory, and it may be necessary to employ a highly trained vibration specialist who, working in close cooperation with the structural designer and the mechanical engineer, could do a thorough job of analyzing the situation.

It is not always necessary to mount the machinery on top of the vibration isolators to prevent noise transmission through the floor slab. Another method is for equipment to be hung from the roof steel by means of vibration hangers.

A separate steel structure to carry the machinery is simply a steel foundation built to carry the machinery and connected to the building only at the columns. The great advantage of this steel foundation is that it is decoupled from all large surfaces which could radiate sound energy easily, so it is important that this structure does not touch the roof or floor slab at any point. Also a check should be made to see that no part of the steel structure is in resonance with the rotating machinery or a severe noise condition could result. Such a situation can be alleviated by pouring concrete into the steel framework if the structure is already fabricated or by changing the steel in the framework.

Floating cooling equipment on a blanket of glass fiber is a new technique and has not been used widely, but it can be very effective when properly applied. The blanket should not be too thin; two to four inches under full load should be satisfactory. On top of this should be poured a concrete base which should be at least five times the weight of the machinery it will carry. Then mount the machinery as would normally be done on vibration isolators on top of the floating concrete base. For details see Fig. 9.

Ducts, Piping and Wiring

Needless to say, it is wasted effort to design foundation systems which successfully isolate the machinery from the building structure, and then install paths through which the energy can easily travel into the building. Even though equipment has been selected to minimize the noise problem, it is still advisable to isolate it from the building through the use of resilient connections between the machinery and ductwork or pipes. Ducts should be separated from the fan by a liberal section of canvas which can bellow out. Fig. 8. In no case should this connection be pulled taut or used to support the ductwork. Flexible hose, especially rubber reinforced with wire, provides the best sound isolation for pumps. Rigid high pressure hose, unless it is necessary, is not desirable as it may be too rigid for effective isolation. For best results, the flexible hoses should be used in pairs with an elbow between them on each line connected to the machinery, as in Fig. 10. These hoses are much more rigid longitudinally than in the transverse direction, and a pair at right angles to each other takes care of vibration in all directions. Of course, any flexible connection tends to become rigid under pressure and in so doing reduces the effectiveness of the isolator. If fluid-borne transmission of sound develops, it may be necessary to put a sound absorber in the piping with a section of rubber pipe before and after it to reduce the fluid borne sound and any flanking paths for the sound along the metal walls of the pipe. The sound absorber could be simply a short expanded section of pipe or a special section designed to reduce pressure pulsations.

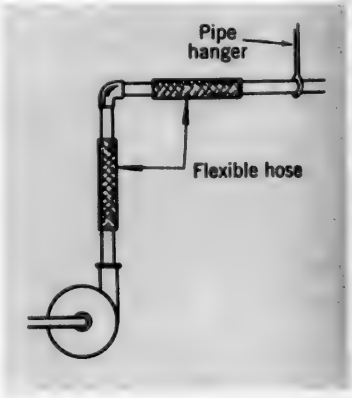


Fig. 10. Recommended method to install flexible hoses for isolation of machinery from piping.

When it is not possible to place flexible connections in the lines, the pipe itself can be used as the flexible connection. This is done by passing the pipe through two elbows so that the connected arrangement lies in three mutually perpendicular planes, illustrated in Fig. 11. A reasonable length of pipe should extend from each elbow permitting the natural flexibility of the pipe to reduce vibration regardless of its direction of motion. In extreme cases, it may be necessary to place a large inertial mass on the pipe farthest from the machinery to prevent transmission of vibrational energy to the building. The pipe hangers shown in Fig. 10 and 11 indicate approximately the closest location for a hanger to the machinery.

Similarly, the electrical connections to the machinery should not be made with rigid conduit, but rather armored or rubber covered cable with slack or as much as a loose 360 deg loop. See Fig. 9.

In some critical work, it may be that the pipes and ductwork should be supported on resilient hangers. Specially purchased hangers may be used for this or it may be sufficient to place a layer of felt or glass fiber around the duct or pipe before attaching the support band. To prevent excessive compression of the soft material, the pipe load should be distributed over a reasonable area.

Tranmission of noise through pipes and ducts from mechanical equipment and through the building is usually under control of the consulting engineer, by some of the means just discussed, but the sound level in the machine room is only indirectly under the control of the engineer, since the manufacturer of the equipment governs its acoustical output. By knowing the acoustical output, the engineer can exercise some degree of control over the sound transmitted into the machinery room through his selection of equipment. He can also decide if it is necessary to enclose the machinery in the machine room and in effect obtain a double walled room around it to reduce the transmission of energy into the surrounding spaces and particularly to the floor below.

Precautions for High Velocity Air Systems

In addition to all of the items discussed, there are some precautions which apply mainly to high velocity air systems that need special consideration. A noise problem is easily created in a high velocity-high pressure system by improper design of ductwork. In this respect, the fan discharge is particularly important. For example, with a top discharge fan the air should not be forced upward immediately after leaving the fan. At this point, the air has a tendency to turn down and it should be allowed several duct diameters to straighten out before being turned up. It is possible to turn the air up directly after the fan discharge, if a well designed elbow with turning vanes is used.

Also, in laying out fittings, it is important to see that two fittings such as a branch take-off and an elbow do not follow each other without a section of duct several diameters long between them to allow the air flow to straighten out. All the precautions in preventing the generation of noise due to air flow can be summed up in one statement: do not allow the air to separate from the duct walls by trying to change its direction too quickly after a previous change unless some guidance is provided.

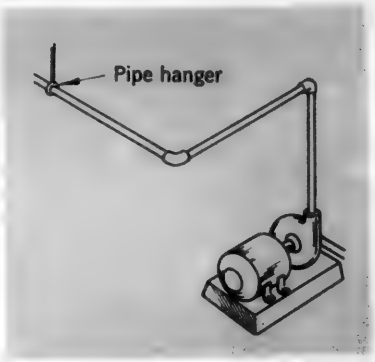


Fig. 11. Recommended installation when flexible hoses cannot be used for vibration isolation.

The success of any installation where the control of sound and vibration are important, depends upon careful planning, design, installation, and above all supervision. The architect, mechanical engineer, and structural engineer have a large responsibility for the success of an acoustical installation, but it is the supervision of the men actually on the job doing the work which will ultimately determine whether the installation will be a success or failure.

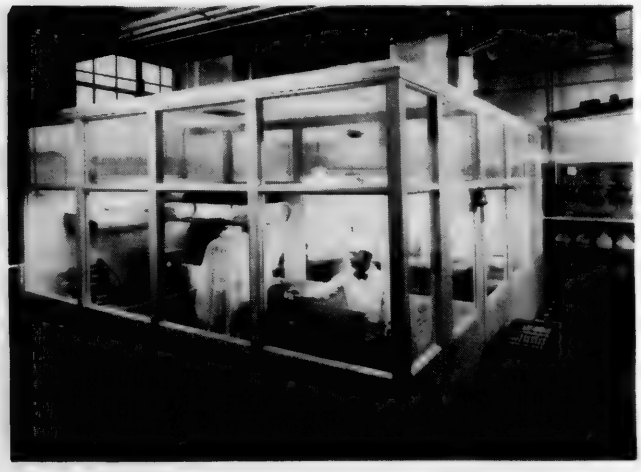
Progress has been made in sound control of air conditioning equipment, but there are some important areas where research is still needed. For example, the air moving within a duct may generate more sound than the fan. This differs from the generation of noise discussed previously in that that noise is probably caused by separation, and the air moving noise is probably caused by turbulence and frictional shear at the duct walls. Its exact cause and importance in duct systems must be thoroughly investigated. It would be useless to locate a sound absorber right after the fan if the bulk of the sound were generated by moving air after the sound absorber. Also, answers are needed to the questions regarding sound generation in such fittings as elbows, branch take-offs and splitters, and also how important these are in the total system sound picture. Before all the problems of sound control in central station air conditioning equipment can be completely resolved, much needs to be learned, but for the present more information is being made available for meeting head-on the growing dissatisfaction with sound levels in year-round air conditioning.

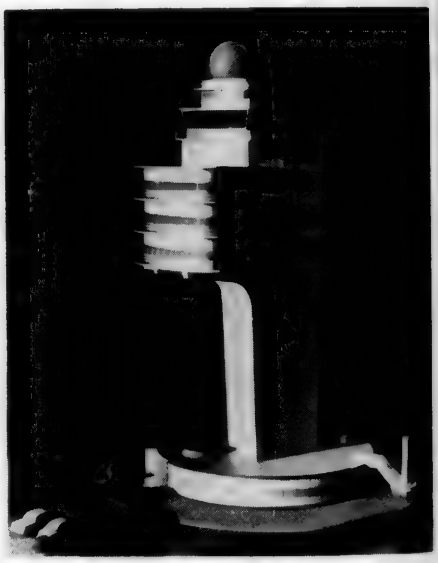
◄ ROOM CONTROL PANEL. The Room of Tomorrow, exhibited recently at the National Hotel Exposition in New York's Coliseum, featured this wall-mounted RCA Whirlpool room air conditioner which can be controlled from anywhere in the room. On the small control panel are dials to regulate amount of fresh air introduced into room, exhaust, air direction, temperature and humidity. In addition, a button controls lighting on the panel and a softly glowing night light on the grille of the wall unit.

▲ COOL CUBICLE. Heat waves are now a thing of the past for Henry Pisarz, operator of the world's first air conditioned newsstand. The tiny structure was transformed from a 4 by 6-ft oven into a cool cubicle by a portable air conditioner which was presented by Carrier Corporation to The Lighthouse, the New York Association for the Blind, Inc.

Picture Paragraphs

▼ CLEAN ROOM. This industrial clean room for processing precision valves and parts for the missile ground support program was recently placed in operation at Superior Valve & Fittings Co., Pittsburgh. Factors precisely controlled are temperature, moisture, dust, pressure, vibration, illumination, ventilation and noise. A 2-ton air conditioning unit, in parallel with electric strip heaters, keeps temperature at 69 deg F; humidity is maintained at 50%. A positive pressure of two ounces is held; air is recycled ten times per hour. Here a trained operator uses 2-way communication box which minimizes entry and exit.





▲ CONTROL TOWER. A contract to install air conditioning, heating and ventilating equipment in the $1.75-million control tower at Newark Airport has been awarded to Hudik-Ross Co., Inc., mechanical contractor. Year-round constant temperatures will be required to insure accurate operation of delicate electronic, radar, and weather equipment.

Control of Radiation for
Steam and Hot Water Heating

LEWIS SMITH
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When designing a control system for steam or hot water radiation, a decision on central control must be made first. Only then can the engineer consider such modifications or additions as may be needed to take care of local conditions, the author explains.

TO the question of how radiators should best be controlled the most intelligent reply that can be given is that "it all depends."

It depends on the heating medium—steam or water—and on whether one or a group of radiators or a whole building with hundreds and sometimes thousands of radiators is being discussed. It depends on the type of radiation used and on many structural conditions, such as window arrangement. It depends on the character of the occupancy, that is, whether an office building, apartment house, school, hospital or factory is considered. Finally it depends on whether a central control is sufficient, whether individual radiator or room control, or both, is required.

The terms *radiator* and *radiation*, as here used, include direct radiators, convectors, and finned pipe and baseboard. Unit heaters and unit ventilators are not included. By *central control* is meant a device for control of a whole heating system from one point, or from several points if the system is divided into zones.

Central Control is Primary

To base all conclusions on the performance of one radiator alone is putting the cart before the horse. There are many types of radiators, each with different characteristics, and one radiator is but a small part of the whole heating system. Control of the system as a whole should be the first consideration. An analysis of performance to meet particular job requirements may then be made. Logically, any discussion of radiator control should begin with a study of the types of central controls available.

Since all heating systems are designed for some selected minimum outdoor temperature, it follows that the primary object of any type of control is to prevent overheating 95% of the time, but at the same time to supply enough heat to avoid stirring up complaints. Central controls, by themselves, can accomplish this object well enough for many buildings, such as apartment houses, but where there is variable occupancy, or occupancy which can not be predicted, as in some office and industrial buildings and school houses, or where the requirements are erratic, as in hospitals, some form of individual control may be needed. This can be effectuated by additional zones or room thermostats. Central controls are not relied upon necessarily for the whole control—they may be used merely to make the primary reduction of overheating, relying on individual control to do the rest of the job.

Steam Systems

Taking steam systems first, three methods of central control have come to be accepted as standard. They are:

1. Intermittent, or *on-off*, control.
2. Orifice, or *modulating*, control.
3. Variable vacuum, or *sub-atmospheric*, control.

The second and third systems are also commonly known as *continuous flow* to differentiate them from the first.

The first system can be and often is applied to the fire itself with some kind of indoor or outdoor thermostatic control. More commonly, however, a motor-operated valve is placed in the steam main, the fire being under the control of a pressurestat. Figure 1 shows diagrammatically how this control admits quantities of steam into the system according to the outdoor temperaure. Most of these controls do not operate on an hourly cycle but

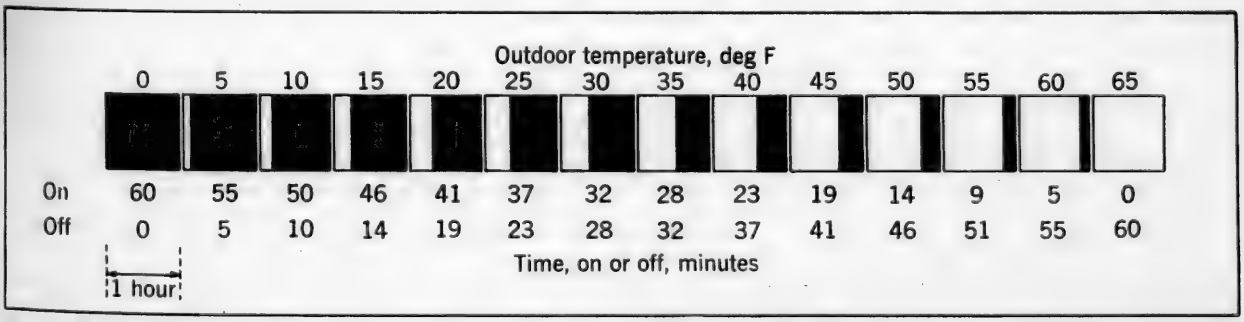

Fig. 1. The intermittent control system admits quantities of steam according to the outside temperature. Diagram is based on an outside design temperature of 0 deg. F.

on a much shorter one, so that *off* periods in mild weather are kept short enough to avoid complaint. So arranged, this type of control is often referred to as *pulsating*.

To reduce fluctuations in boiler pressure, a by-pass valve is often included to feed some steam into the system when the main valve is closed, this by-pass remaining open until no heat is needed. whereupon it is closed by an outdoor thermostat. Because in larger buildings it becomes increasingly difficult to balance steam circulation so that radiators at the ends of long mains will be at the same temperature as those nearest to the control valve, it is common practice to use more zones with this system than with the continuous flow type. The advantage which the intermittent system has in installed cost must be weighed with the increased cost due to the arrangement of steam mains for multiple zones. Partial heating of the radiators will occur in mild weather.

Modulating Steam Supply

A modulating system has the advantage of maintaining a continuous flow of steam whenever heat is required. Control is accomplished by positioning a valve in the steam main by means of a thermostat, usually an outdoor controller, so that the pressure differential across the orifice plate at each radiator inlet is continuously adjusted to regulate the steam admitted into each radiator in accordance with the outside weather. The performance is shown in Fig. 2. The radiators will be full of steam at the design temperature, with partial filling increasing as the weather moderates to a complete cutoff at 65 deg F outdoors.

Where the radiators are short and located under ordinary windows, partial filling with steam will cause no complaint, but if long runs of finned pipe or baseboard are used under windows extending from column to column, partial filling is most likely to induce complaints. This partial filling begins at all outdoor temperatures above the design base. In cold weather the absence of steam at the trap end will allow cold downdrafts from the windows to affect the occupants. One cure for this, although it may be an expensive one, is to use two tiers of finned pipe with a return bend to make a continuous circuit. Then the finned pipe can be only half full of steam yet keep a warm blanket under the windows to counteract the cold draft. When partial filling of less than 50% will do, outdoor temperature will be high enough so that the drafts will not be noticed.

Both the foregoing system operate with either gravity or vacuum returns.

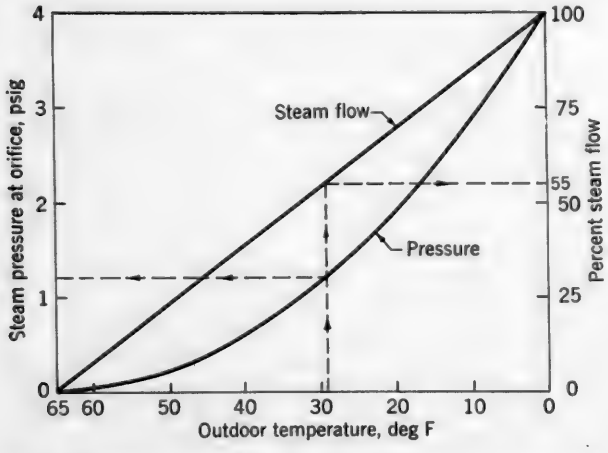

Fig. 2. Orifice control at each radiator inlet assures full steam flow at outside design temperature (here, 0 deg F) with only partial filling until complete cutoff at outside temperature of 65 deg.

Sub-Atmospheric Control

The third system, the *sub-atmospheric*, operates most of the time with steam in the radiators under a vacuum. It must have a vacuum pump to remove condensate and air from the system, capable of doing this up to 25 in. Hg vacuum.

Below atmospheric pressure, steam systems experience an increasingly rapid drop in temperature and increase in volume, as shown in Fig. 3. At 25 in. Hg, the temperature has dropped to 133 deg and volume has increased about 5½ times. By throttling the rate at which steam is admitted into the system with a control valve thermostatically operated from either the inside or the outdoor temperature, and keeping the pump in step with the vacuum, the temperature of the steam in the radiators can be varied from 218 to 133 deg with the radiators completely filled with steam, no partial heating occurring to that point. Beyond that point (that is, in very mild weather) partial filling will take place until no heat is required.

One marked advantage in the sub-atmospheric system is that long runs of finned pipe or baseboard stay warm for their full length in cold weather. Thus there is no need for double tiering for control purposes.

With either modulating or sub-atmospheric systems, if special control of certain areas or rooms is needed to compensate for local irregularities, these areas may be put on separate zones. If that is not enough, then each radiator may be equipped with a valve operated from a room thermostat. In this case the central or zone control would be set so that the building or zone would be slightly overheated, relying on the radiator control to do the rest. Continuous-flow systems operate, especially in mild weather, on such low pressure differentials that a modulating valve may behave more like a two-position valve. If these valves are for use on a high vacuum system, the manufacturer should be advised so that proper adjustments can be made.

If central controls are omitted, complete reliance must be placed on individual radiator control. This imposes

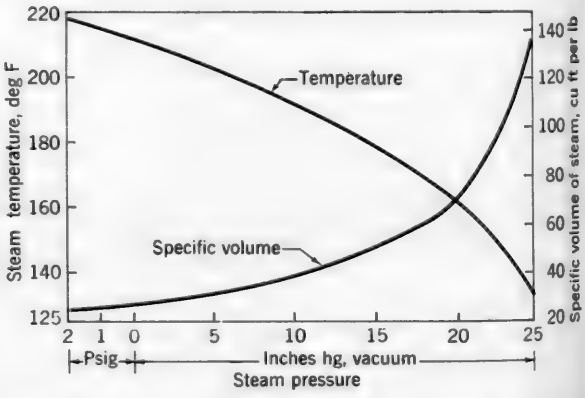

Fig. 3. Temperature, pressure, and volumetric properties of steam above and below atmospheric pressure, as shown, are utilized in the sub-atmospheric control system.

a difficult burden on this control because only "hot" steam, at least 215 deg, is available, and that is so much too hot most of the time that it can be used for only very short periods. If two-position control is used, the *on* period gets to be very short and the *off* period very long, in any event causing the control to operate with great frequency. Yet, proportioning control with partial filling may be objectionable. This is a problem that is best worked out on each job depending on the kind of radiation used.

Hot Water Control

Hot water has some characteristics quite different from steam. For example, with constant supply temperature, reducing the rate of flow has far less effect on the heat output of the radiators than a similar reduction in steam flow. Partial heating can not take place as with steam. While flow rate may be reduced, the temperature drop increases so much that there is only a small drop in heat output. In order to effect a substantial reduction in heat emission, the control valve becomes so nearly closed that little valve travel is left and the operation is unsteady. One answer to this problem is a three-way valve which bypasses the water around the radiator. This has the further advantage of maintaining a constant flow of water in the system with a steady pump pressure. However, the cost is higher. On this account two way on-off valves are commonly used for each radiator, with a by-pass at the pump to maintain steady pressure. Unless water temperature is controlled at the source to keep it in step with the outside weather, even two-position control is under a serious handicap because it can admit only very hot water or none at all. As with steam there arises the desirability of central control.

The best and most common form of central control for hot water is one in which a three-way mixing valve is controlled by outside temperature and is arranged to mix return with flow water. Radiator valves will then shut off only occasionally and so few of them will shut off simultaneously that water pumped to the system will be fairly steady. If boilers are used, water is maintained at constant temperature. If steam convertors are used for generating hot water, the control valve may be placed in the steam supply main and the three-way valve on the water side may be omitted. With this central control of the circulating water temperature the job for the radiator valve, if used, is much easier.

With either steam or water the basic consideration should always be the central control, with such modifications or additions as may be necessary to take care of local conditions.

Diesel Waste Warms Arctic Facilities

Design outside temperature of —60 deg F and fuel oil costs from four to nineteen times that in the United States prompted some very careful engineering in the design of a heating and ventilating system for the facilities of the Defense Early Warning Line in the Canadian Arctic.

In addition to the high heat losses, the danger to personnel as the result of a breakdown of the heating system in such frigid weather had to be considered. Thus, good insulation of the structures, a dependable heat source, an emergency heat source, and a system very economical in the use of fuel had to be devised. The solution was found by Western Electric Defense Project engineers, responsible for the design and construction of buildings to house DEW Line personnel and equipment, in utilization of the waste heat of the Diesel engines used to drive generators producing electricity. Considerable power is needed around the clock to power the electronic searching and tracking equipment.

Design Calculations

Walls, floors, and ceilings of the buildings are fabricated of insulated plywood panels, 4 and 8 inches thick. A conservative value for panel heat conductance of 0.1 Btu per deg per hr per sq ft was chosen, though a value of 0.8 is closer for the 8-inch panels. Design temperature drop of 130 deg is based on the lowest expected temperature of —60 deg and design inside temperature of 70 deg.

According to climatological data published by the Canadian government, an *average* low outside temperature of —40 deg could be expected. Heat loss from the usual installation based on this figure is a calculated 426,800 Btu per hr. Experiments with the Diesel engines showed that 427,400 Btu per hr could be reclaimed from two engines, the normal complement of the installation, when at ¾ full load. When temperatures fell below —40 deg, supplementary electric heat could be used.

Hydronic System

The system installed, as described by Henry Vaugle, one of the Defense Project engineers, in *The Western Electric Engineer*, is basically as follows: Hot water heating is used. A circulating pump is placed on the building return line. From there the water goes to a shell and tube heat exchanger for extraction of heat from the Diesel jacket water, thence to another shell and tube exchanger where the water is further heated by the hot diesel exhaust gases, thence to an 18-kw electric booster heater, and finally to the building supply.

Control of the system is achieved by automatically actuated butterfly valves on the hot gas exhaust which can bypass gas around the heat exchanger; by manual control of the electric booster heater; and a bypass connection that mixes flow and return water from the building. A compact, packaged, oil-fired hot water boiler with a rated output of 450,000 Btu per hr, is the stand-by heat source.

Maintenance of Centrifugal Pumps

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Part 2 of a three-part article. Part 1, last month, discussed the various factors which may come into the decision to carry out a complete overhaul on a centrifugal pump. This article takes up the various practices followed in carrying out repairs of individual pump parts, starting with the maintenance of casings.

PUMPS applied to the handling of non-corrosive water or liquids are usually not subject to any particular casing wear. At the same time, it is advisable that the casing waterways be thoroughly cleaned and repainted during a complete overhaul. A suitable paint should be used which will firmly adhere to the metal so that the water velocity will not wash or jet it off. To give best results efficiency-wise, an enamel-like finish is desirable. Based on local experience, a program of cleaning and repainting the casing should be followed so the protective coat is never fully eroded before replacement, otherwise corrosion may result.

Pumps handling gritty or sandy water are naturally more subject to casing troubles. Erosion or wear can be lessened by originally selecting pumps with low water velocities and with casings made of a fine grain metal. Generally, the use of a 1 to 2% nickel cast iron gives sufficient added resistance, but with a high concentration of sand, even a more resistant, more expensive material for the casing might be warranted.

In the last few years, progress has been made in processes of rubber coating the waterways of pumps and this may be found desirable in some applications. If, in cases of sandy or gritty water, the casing is to be protected primarily by periodic painting, care should be taken to select a type suitable for the local conditions and to establish a schedule of maintenance to suit.

Special care should be exercised to examine the casing for corrosion, which frequently manifests itself by the graphitization of cast iron, the ferrous particles being washed out due to electrolytic action and deposited on the bronze pump parts. If severe graphitization takes place, the manufacturer should be consulted on the possibility of substituting materials which would be more impervious to the characteristics of the liquid pumped.

Reconditioning Metal

If the casing is pitted or eroded in places, it is often possible to restore it by welding, brazing, silver soldering or metal spraying, depending upon the material of the casing and the facilities available. The authors have knowledge of several large centrifugal pumps on water works service in which corroded areas, located where the water velocities are low, were filled with properly anchored concrete.

Special care must be taken to examine and recondition the metal to metal fits where stationary parts such as casing rings, diffusers or stage pieces seat in the casing. If the latter is made of steel, and these fits show signs of erosion, it might be advantageous to face them with 18-8 stainless steel and refinish.

Erosion of Volute Tongue

It is not infrequent that the cut-water, or volute tongue as it is also called, is eroded. This happens when a pump handles water wtih some sand in suspension, for instance. Sometimes, the tongue will become eroded when the periphery of the impeller is located too close to it. Another fairly common cause is galvanic action between a cast iron casing and bronze fittings. The cast iron graphitizes and wears away most perceptibly in areas of high velocity, such as near the volute tongue.

The proper procedure in correcting this condition is to cut back the tongue so that it is straight across, and then to file it to a smooth rounded edge—shown in Fig. 1.

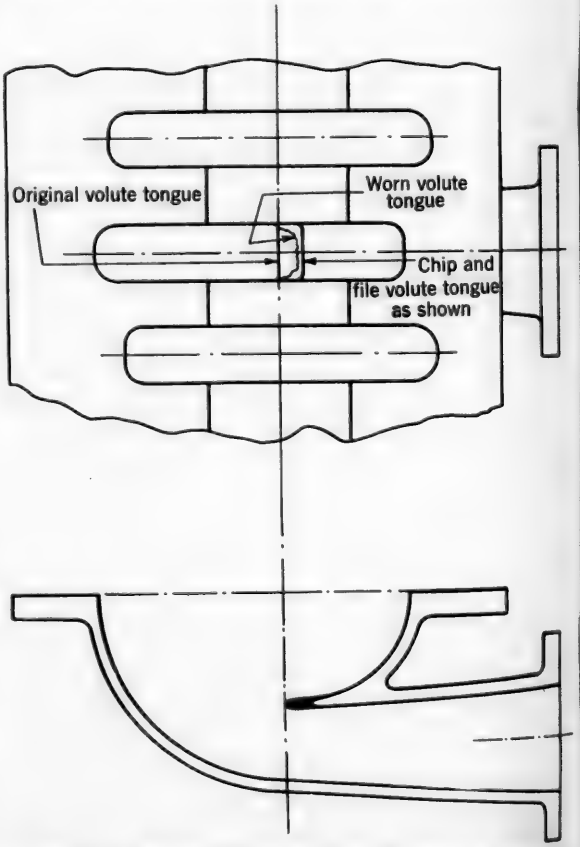


Fig. 1. Restoring volute tongue to proper shape.

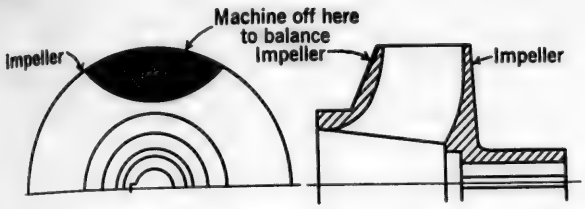


Fig. 2. Method of balancing impeller.

This will have no unfavorable effect on the pump capacity, but rather the contrary. Cutting back the volute tongue of a centrifugal pump is often resorted to if a few extra percents of capacity have to be squeezed out of a pump without putting in a larger diameter impeller. The effect is due to the resulting increase in the casing throat area which, with a given casing velocity, results in an increased flow.

Care should be taken not to distort or warp the casing during the overhaul and, after repairs are completed, the horizontal flanges of an axially split casing should be finished to a flat surface with hand tools. Of course, if the repairs are of a very serious nature, they are carried out at the shop of the manufacturer at which time the casing flanges may be refinished and the casing rebored.

Gaskets

Except for some very special designs, every pump has gaskets which may be damaged when a pump is opened. A new gasket should be available for replacement if needed. If the old gasket adheres to the lower half of the casing and is in good condition, it is not necessary to replace it, but it should be replaced if damaged in any way. The new gasket should be of the same thickness as the original one, as much as possible, of the same type of material so that it will compress to the same extent. Too thick a gasket will generally lead to casing cutting through leakage; if the gasket is thinner than the original one, tightening the two casing halves may exert undue force on the casing wearing rings and may distort them. This, in turn, may lead to contact with rotating parts and to severe damage.

In installing a new gasket, the inner edge must be accurately trimmed along the edge of the stuffing box bore. At all points where the gasket abuts on the outer diameter and sides of stationary parts, the edges must be trimmed squarely and neatly—sufficiently overlapping so that the upper half of the casing, when being tightened, will effectively press the edges of the gasket against the stator-parts, insuring proper sealing. This trimming operation is most satisfactorily accomplished by first cementing the gasket to the lower half of the casing with shellac and thereafter cutting all edges square with a razor blade. Of course, all foreign matter must be removed from the casing flanges before applying the gasket to the lower casing half.

It is recommended that powdered graphite be rubbed into the gasket before replacing the top casing half in reassembling the pump. This will prevent the gasket from sticking to the upper half when it is again removed.

MAINTENANCE OF IMPELLERS

An impeller removed from a pump casing should be minutely examined for unusual wear. In addition to wearing ring joint wear, an impeller may be excessively worn through abrasion, corrosion or cavitation.

Most pumps used on general service have bronze impellers; those handling treated and clean water have a reasonably long life. Occasionally, these pumps are operated on high suction lifts or at part capacities and impeller life is affected. Such situations require consultation with the manufacturer to see if another impeller design, more suitable for the actual operating conditions, can be obtained.

Pumps handling water containing sand may have bronze, cast-iron, nickel-cast-iron or even chrome-steel impellers depending upon the amount of sand, its abrasiveness and the character of the water itself.

Generally it is desired to use an impeller material which will form a protective coating or film that adheres firmly to the underlying metals and is not washed off by the stream of water. The presence of abrasive material in the liquid pumped naturally erodes such protective films on many metals thus making their use undesirable.

Abrasion wear is best checked by a sedimentation test, letting a quantity of the pumped liquid stand in a glass container for a couple of hours and examining the settled particles for grit. A chemical laboratory analysis of the pumped liquid is generally necessary to determine whether corrosion is responsible for undue wear. Finally, cavitation is most generally accompanied by pitting in the suction areas of the impeller and can be frequently detected by the crackling noise made by the pump during operation. In many cases, the increased cost of special alloys is warranted if impellers become rapidly pitted or eroded. Of course, if corrosion is detected, better materials are definitely necessary.

Impeller Wear

In small pumps, wear on an impeller is best corrected by the replacement of the impeller by a new one as the size does not permit rebuilding the impeller vanes. In medium size impellers, while rebuilding by brazing, soldering, welding, etc. is feasible, the cost is high and replacement of the entire impeller is better. Most large size impellers can be kept in service for many years, even with abrasive material in the liquid, by building up the eroded areas in some manner.

Wear may occur in the impeller hub over the shaft mounting or at the keyway, although this may happen rather rarely. The first may be due to porosity in the impeller casting which permits water to seep through from the higher pressure region to the fit between the shaft and impeller, and to ultimately erode or corrode this fit. In most cases, the shaft material will be more readily attacked than the impeller and corrosion will show on the shaft. Wear at the keyway may occur if the impeller is too loose on the shaft or the key not properly fitted. Finally, impellers may develop cracks because of excessive vibration, or due to strains set up during the casting process and not detected at the time the impeller was machined. Cracked impellers, it has been found, cannot be repaired successfully and are best replaced.

Balance

Whenever an impeller is removed from the pump rotor during an overhaul, a recheck of the balance of the impeller is recommended. Such a recheck is, of course,

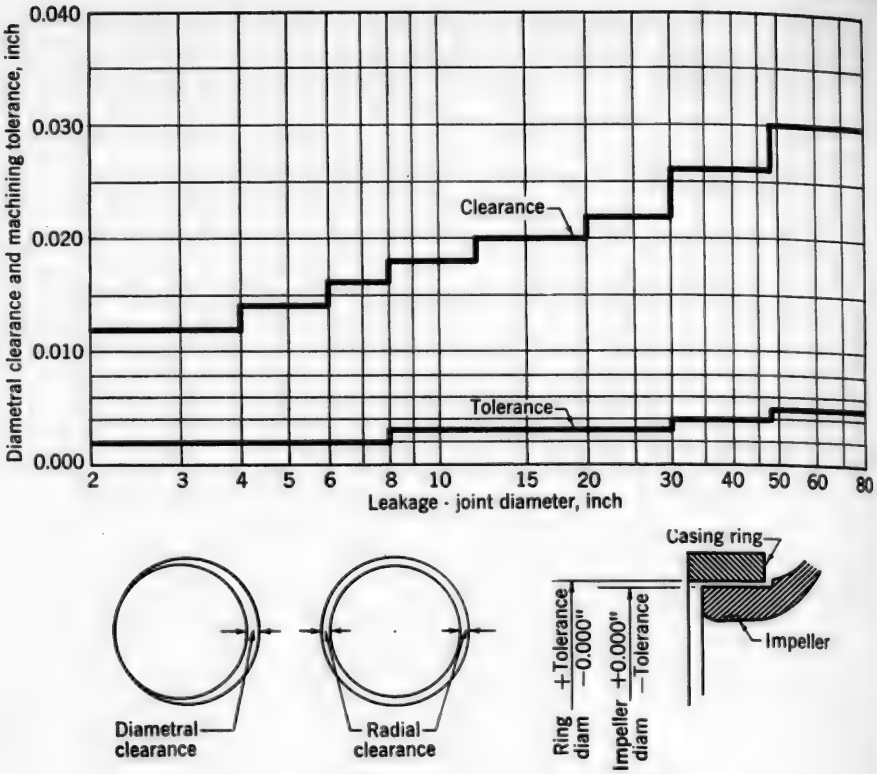


Fig. 3. Recommended wearing ring clearances for single stage pumps and for non-galling materials.

essential whenever the impeller has been repaired in the field. To balance an impeller by hand, the impeller must be mounted on an arbor, the ends of which are placed on two parallel and level knife edges. If the impeller is out of balance, it will turn the arbor and come to rest with the heavy portion down. Metal must then be removed from that portion of the impeller but this must be done (1) so the pump performance is not affected and (2) so eddy currents, that will accelerate erosion, do not result. For that reason, the drilling of holes is undesirable.

For a shrouded impeller, the best practice is to mount the impeller off center in a lathe and to take a cut from the shroud, deepest at the periphery as shown in Fig. 2. This might be done on any one or both shrouds depending upon their actual thicknesses and the amount of metal which must be removed.

In semi-open impeller pumps, the metal removed can be taken from the shroud if the design permits or possibly from the under part of the vanes if the vane or vanes on the heavy side are thicker than the others. This latter method is used in the case of open impellers.

MAINTENANCE OF WEARING RINGS

Several questions arise in connection with wearing ring maintenance. These are:

1. Can impeller rings be mounted on an impeller and used without further machining?
2. What is the proper clearance between rings?
3. How much wear should be allowed before renewal?
4. How can wearing ring clearances be determined?

As to Question 1, most impeller rings are now pressed on the impeller. There is always the danger that some distortion may result during the mounting process. It is advisable, therefore, after mounting the ring on the impeller to check the shaft and impeller assembly on centers to see if the new ring's surfaces are true and, if not, to true them up. If facilities are available to do this work at the plant, it would be as easy to get slightly oversize rings from the manufacturer and, after mounting, turn the wearing surface to the proper diameter.

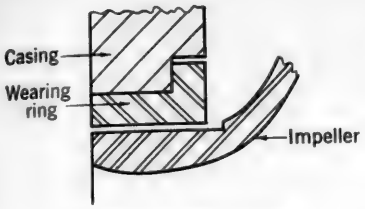
As to Question 2, Fig. 3 shows one manufacturer's standard for clearances and tolerances for single stage general service type of pumps when the two metals making the wearing joint are non-galling. They apply, therefore, to the combination of bronze with a dissimilar bronze, cast iron with bronze, steel with bronze, monel metal with bronze and cast iron with cast iron. When the metals involved gall easily, such as the chrome steels, these values should be increased by about 0.002 inch. In the case of multistage pumps, the basic clearance should be increased by 0.002 inch on the diameter for rings up to 6 inch diameter; by 0.003 inch for larger rings. The tolerance indicated is "plus" for the casing ring and "minus" for the impeller hub or the impeller ring.

Example

The following example is given for a single stage pump with joint of a non-galling combination of materials.

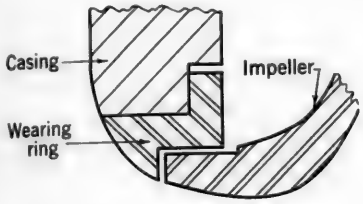
If casing ring diameter is 9.000-inch, correct machining dimension would be 9.000-inch + .003; 9.000-inch − .000. The impeller hub (or ring) would be (9.000-inch − 0.018-inch) or 8.982-inch + .000; 8.982-inch − .003. Actual diametral clearances would be between 0.018-inch and 0.024-inch.

Naturally, if the manufacturer's recommendation for ring clearance and tolerance for the individual pump is known, it should be followed.



Flat type wearing ring

Fig. 4. Casing ring of L-nozzle type.



L - type wearing ring

It is difficult to make a general statement on the amount of wear that should be allowed before a pump is dismantled and the wearing joint renewed, as too many factors are involved. Internal leakage through the rings naturally means a loss in efficiency and ring renewal should be such that the cost of dismantling will be offset by the power savings. Thus with constant use and high power costs, more frequent renewal can be justified than for pumps used infrequently or when power costs are low. A rough rule that 100% increase in ring clearance justifies ring renewal might be taken as a guide.

In general, even if the clearance is not excessive and the pump may be reassembled without renewing the wearing ring joint, it may be advisable to check the hub diameter of the impeller and the inside diameter of the stationary wearing ring for indications of eccentricity of wear.

In some cases, the wearing ring clearances may be measured by inserting a feeler gage between the stationary and rotating parts.

If the wearing ring construction is of the L-type, Fig. 4, and the lip of the *L* prevents the insertion of the gage, an approximate check of the clearance may be made in the following manner without dismantling the motor. (This operation, however, is best carried out with the rotor removed from the pump casing):

1. Mount a dial indicator on the impeller, Fig. 5, and, with the stationary ring resting on the impeller wearing ring hub, set the dial reading to zero.
2. Without moving the impeller or dial indicator, push up on the stationary ring from below and record the maximum dial reading. This corresponds to the diametral clearance.
3. Repeat this operation for every clearance joint and make a record of all readings.

The method described is most applicable to multistage pumps, since in the case of single stage pumps, once the rotor is out of the casing, the stationary rings may be freely removed and the clearance determined by miking the two diameters and followed by calculating the difference.

One note of warning: This short-cut method will disclose the extent to which clearances have increased, but will give no indication as to the condition of the adjacent clearance surfaces. In other words, the presence of burrs, grooves or indentations caused by the passage of foreign matter through the clearances and the resulting damage to the surfaces will go undetected.

RESTORING CLEARANCES

Information will now be given for restoring clearance for three types of pump design.

Pump Without Rings

To restore the clearance between the impeller and casing after wear occurs in pumps in which no ring is provided, the operator must (1) buy new parts, (2) build up the worn surfaces by welding, metal spraying or other means or (3) providing sufficient metal is available either in the casing part or on the impeller hub or both, install a wearing ring or rings.

Pump With Single Rings

There are three methods feasible in restoring the wearing ring clearance of a pump with single flat or L-type ring construction:

1. Obtain a new casing ring bored undersize from the manufacturer and true up the wearing ring hub of the impeller by turning down in a lathe.
2. Build up the worn surface of the wearing ring by welding or metal spraying so that it can be bored undersize and true up the wearing ring hub of the impeller as directed in (1).
3. True up wearing ring by boring oversize, build up

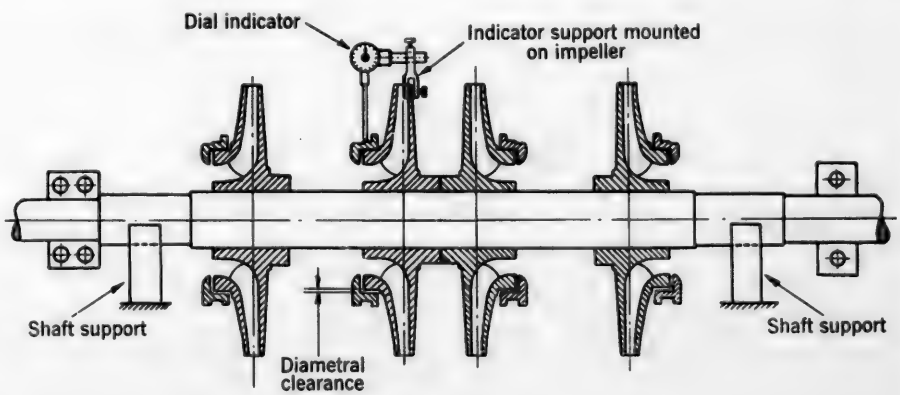


Fig. 5. Measuring ring clearances with a dial indicator.

the wearing ring hub of the impeller and machine to give correct clearance with rebored ring.

Methods (2) and (3) are difficult to do successfully and are only feasible in the case of larger pumps and if equipment is available so the work can be done on the premises. Usually, building up the wearing ring hub of the impeller by welding is very difficult and, in case the wearing surfaces are to be so restored, a pump with double ring construction would be preferred. Method (1) is generally the best procedure.

Pump With Double Rings

If the pump is provided with double flat or L-type wearing rings, the clearances may be renewed by one of the following methods:

1. Obtain new oversize impeller ring and use old casing ring bored out larger.
2. Obtain new casing ring bored undersize and use old impeller ring turned down.
3. Renew both rings if necessary.
4. Build up either the casing or impeller ring by welding or metal spraying, machining the other. By altering the ring build-up, the original leakage joint diameter can be closely maintained.

The comments as to the relative merits of these various methods given for single ring construction pumps apply to double ring construction as well.

Other Types of Ring Construction

As for rings of other than the flat type, maintenance should follow the manufacturer's recommendation. In the case of labyrinth rings, the complicated form of the parts generally does not permit either building up the worn surfaces or even utilizing one part by remachining. As a result replacement of both rings is advisory.

The next article will discuss the maintenance of pump shafts, shaft sleeves and bearings, and the reassembly of pump rotors.

Cooling Loads of Refrigerated Trailers

A method for determining the cooling load of refrigerated trailers is currently under study at the National Bureau of Standards in a program sponsored by the Department of Agriculture, the Quartermaster Research and Engineering Command, the Truck-Trailer Manufacturers Association, and the National Bureau of Standards. The objective of this cooperative project is the development of a standard laboratory rating method that will adequately simulate the heat transfer conditions under which trailers are actually operated on the road.

For the road tests, carried out at 50 mph average road speed, a tractor was altered to carry a two-stage gasoline-engine-driven refrigerating system and an electric generator, also gasoline-engine-driven.

Comparison of laboratory and road tests thus far shows that the heat gain of a refrigerated trailer was significantly greater during road operation than under stationary laboratory conditions for the same ambient temperature and humidity. This increase ranged from about 20 to 30% for the three trailers at ambient conditions of 100 deg F dry bulb and 50% rh. Since these ambient conditions were not attained during the road tests, this comparison is based on extrapolation of the observed data to the standard laboratory test conditions. The extrapolated heat gain values of the three trailers for these conditions ranged from 9000 to 12,600 Btu per hr for a road speed of 50 mph.

The increase in heat gain on the road was due principally to air leakage into the trailer construction under the impact pressure of the air against the front of the trailer. Additional small increases were caused by solar radiation and the movement of air, heated by the engine, under the floor of the trailer.

Air leakage and ice accumulation in the trailers were not negligible even under stationary conditions in the laboratory. The weight gain rates caused by ice accumulation averaged 0.32, 0.54 and 0.98 lb per hr for the three trailers during the laboratory tests. By assuming that the leakage air entered the trailer walls at ambient conditions of temperature and humidity and left the trailer body saturated at 0 deg. the air leakage rate and the heat transferred to the cooling unit by the air leakage was computed for each trailer from the rate of weight gain. On this basis the minimum air leakage rates in the laboratory were 235, 395, and 715 cu ft per hr and the corresponding values of heat transfer caused by the air leakage were 740, 1250, and 2270 Btu per hr.

If the heat transmission rate per degree temperature difference on the road, exclusive of heat transferred by air leakage, were assumed to be the same as in the laboratory, the air leakage could be deduced for the road tests. This procedure results in minimum air leakage rates for the road tests of 970, 860, and 1590 cu ft per hr and corresponding heat transfer rates of 3070, 2730, and 5030 Btu per hr caused by air leakage at the standard test conditions. On this basis, the heat gain due to air leakage ranged from 32 to 69% of the transmission heat gain. These percentages indicate that significant reductions in cooling load could be achieved by eliminating air leakage in trailer bodies.

The effects of solar radiation on a trailer are largely nullified by the rapid air motion over the vehicle at 50 mph. In a typical test at this road speed in bright sunshine, incident solar radiation raised the surface temperature of the roof and one side of the trailer about 7.5 deg above ambient air temperature. On a weighted-average basis, this corresponds to approximately three degrees rise in temperature for the entire exterior surface. When the trailer was sitting still, the sun sometimes raised the roof temperature by as much as 25 degrees.

The underside of the trailer warmed up as much as 15 degrees above ambient temperature during road operation, principally by waste heat from the tractor engine. This rise would not cause a very large increase in over-all heat gain of the trailer unless chilled air were circulated around and under the load.

LOUIS BLENDERMANN ON

PIPING AND PLUMBING

Salt Water Distribution System

THE modern hotel is a complex building housing the different services and facilities necessary for proper hotel operation to provide comfort for its guests. Plumbing systems that are often included in the average hotel are:

1. Sanitary system
2. Storm system
3. Cold water
4. Hot water
5. Chilled drinking water
6. Lawn irrigation
7. Fire standpipe
8. Sprinklers
9. Vacuum cleaning
10. Swimming pool
11. Kitchens
12. Other specialized plumbing systems.

This list covers the general systems required to serve the varying needs of a hotel. Moreover, each of these systems must be adequately designed to fulfill the heavy demand load that a building such as a hotel places upon them.

For hotels located near the ocean front another type of system is often required. It is a salt water distribution system. Many hotels presently situated near the ocean front are equipped with this type of system which is an added feature or attraction for the hotel and is usually requested by the hotel owner.

Benefits of Salt Water

Most people go to the shore to enjoy its bathing facilities but in addition, to gain the benefits of the sun and salt air plus the heathful benefits that are derived from the salt water itself. In many cases, people that are convalescing from an illness or injury are advised to spend some time near the shore. A salt water distribution system affords year-round benefits despite the weather, condition of the surf, or temperature outdoors. It is an added attraction for hotels located in colder climates so guests can enjoy the benefits of the salt water during the winter right in the hotel.

Obtaining the Salt Water

The two major factors to be considered before attempting the design of a salt water distribution system is the location of the hotel and the quality of the intended source of supply. The hotel must be located near or adjoining the shore front and permission must be obtained from the local or governing authorities to extend a suction line out into the ocean. The second consideration is the quality of the salt water. If the salt water is polluted or dirty then the system should not even be considered.

Assuming that the hotel is situated near a clean, wholesome supply of salt water, then the engineer must check with the local or governing authorities to learn of requirements concerning the installation of piping,

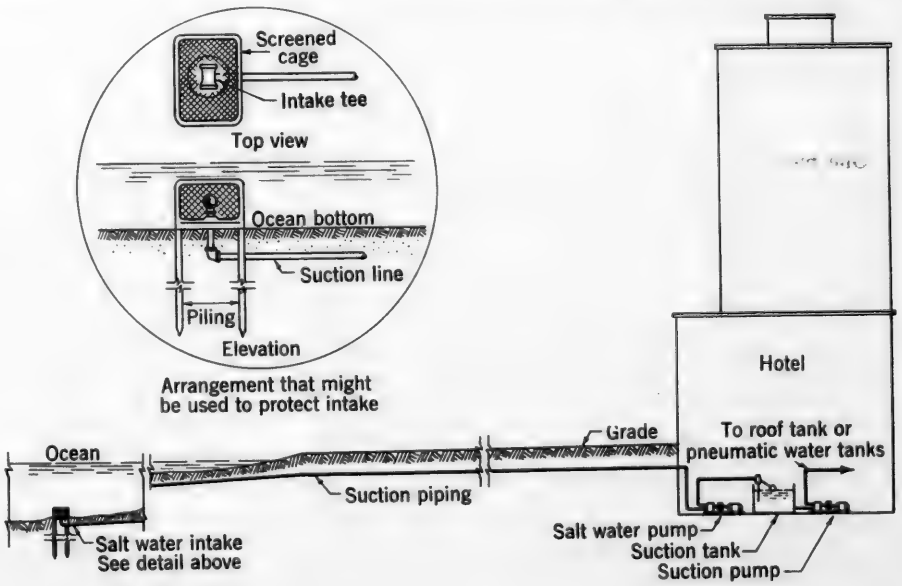


Fig. 1. Arrangement of salt water intake, piping and pumping equipment.

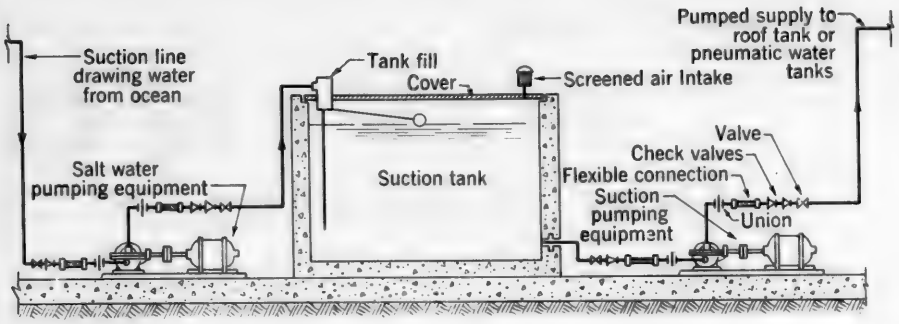


Fig. 2. Arrangement of equipment and apparatus to pump salt water from the ocean to the roof tank or pneumatic tank system.

how far off shore the intake must be placed, and the type of intake that may be utilized. These matters are of vital importance and must be carefully checked with the authorities.

In this article we shall use a 20-story hotel as the basis for design. The method that may be employed to draw salt water from the ocean is shown in Fig. 1.

Piping is extended out into the ocean as shown in Fig. 1. The distance to which the piping must be extended must conform with the requirements of the local or governing authorities. Piling is driven down to hard pan and a substantial frame is secured to or erected on the piling. The salt water intake consists of a bull-headed tee connection with a diameter that is twice that of the suction line and is set well above the frame to prevent any possibility of sucking sand. A pipe flange anchors the intake pipe rigidly to the frame. The intake connection is protected by a screened cage of a material best suited for the purpose. The cage is also securely anchored to the frame. Access should be provided at the top of the cage to allow periodic cleaning of the interior of the cage. Skin divers accomplish the task of cleaning the interior and exterior of the cage in a very easy manner. Rocks may be placed around the cage if desired. Again, the authorities will usually advise on the specific type of intake arrangement to be constructed. Many other arrangements, including well points, may also be used. The piping material and its method of connecting is information about which the authorities may advise. If the engineer must make this selection himself, it is recommended that he consult with a piping manufacturer to establish the most satisfactory material.

Means of Pumping

There are a number of different methods that may be used to draw water from the ocean.

One method is shown in Fig. 2. Here a pump draws salt water from the ocean and discharges it into the suction tank. If desired, a strainer may be placed on the suction side of the pump to intercept any foreign objects that might be drawn into the system despite the screened cage. The suction tank can be of waterproofed concrete or other suitable material that may be favored. The capacity of the suction tank must be determined on the anticipated demand for salt water in the hotel and the particular pumping cycle needed for the roof tank or pneumatic water system. For the 20-story building used as example, the tank should be not less than 10,000 gal. Attention should be given to the feasibility of using a two-compartment tank; this is very practical since it permits one compatrment to be cleaned while the other functions. The suction pump delivers salt water to the roof tank or the hydropneumatic tanks.

Although only single pumps are shown in Fig. 2, dual pumping arrangements are preferred. The piping should include flexible connections to prevent the transmission of pumping noises throughout the system. Likewise, the bases of the pumps should be isolated to absorb pumping noises.

Typical Riser Arrangement

Figure 3, shows a typical riser diagram for the 20-story hotel used for example in this article. It illustrates a gravity system served by roof tanks.

This particular riser arrangement is intended to serve the vertical stack of bathrooms. Note that the riser is comprised of a soil stack, vent stack, chilled drinking water, cold water, hot water and cold salt water. A hot salt water distribution system has not been shown or included because of the difficulty encountered in generation and distribution of hot salt water. Hot salt water has a very corrosive effect on all piping materials. Therefore, unless the hotel owner insists that hot salt water be furnished, it need not be included. A hotel guest can obtain a hot salt water bath merely by filling the tub

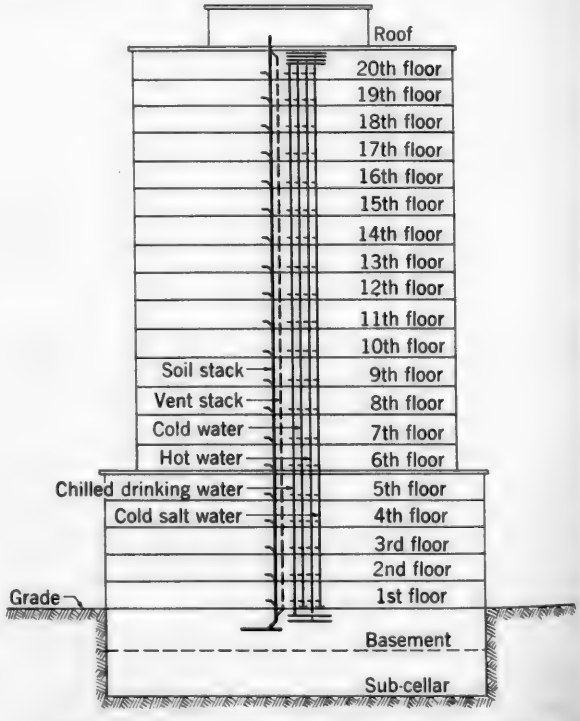


Fig. 3. Single plumbing stack in a 20-story hotel.

partially with cold salt water and then adding fresh hot water to gain the desired temperature.

Pneumatic Water System

There are several methods that can be used to distribute cold salt water in the building. One is the pneumatic water system which is pictured in Fig. 4. Two separate pneumatic water systems are employed. One supplies the upper 10 stories of the building while the other handles the lower 10 stories. Pumps draw water from the suction tank and supply it under pressure to the tanks. An air compressor supplies the quantity of air needed in the tank and furnishes the pressure needed to force the water up to the various floor levels in the building. Other arrangements of the pneumatic water system can be used with equal success.

Roof Tank

Another popular method that can be employed is the roof tank system. This method is illustrated in Fig. 5. The pumping equipment draws the salt water from the suction tank and lifts it up to the roof tank from which the water is distributed by gravity throughout the building. Pressure reducing valves are placed on those branches where the water pressure exceeds any prescribed water pressure that the engineer has previously selected.

Since both the pneumatic water system and the roof tank are in diagrammatic form, most of the component control devices and apparatus that are part of the system are not shown.

Piping Materials

Salt water is rather difficult to handle with any piping material. However, materials are available that are quite favorable for this application. Here again, the piping manufacturers should be consulted for their recommendations. Any specific suggestion on the matter of materials that can be used with salt water has been avoided

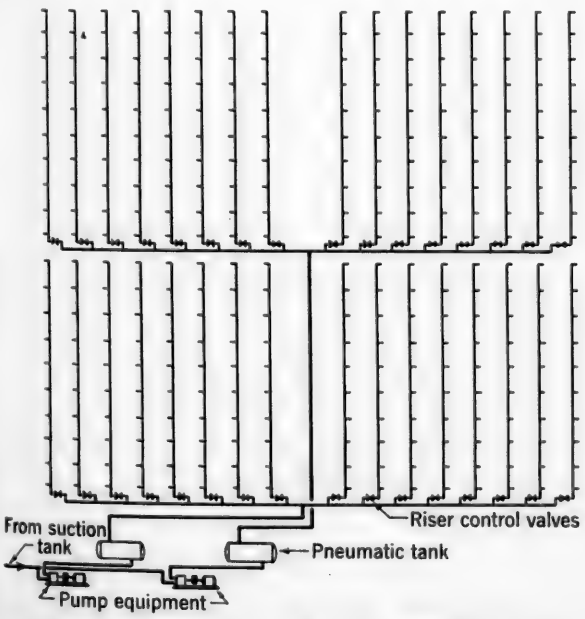


Fig. 4. Riser diagram for a salt water distribution system in a building, served by a pneumatic tank system.

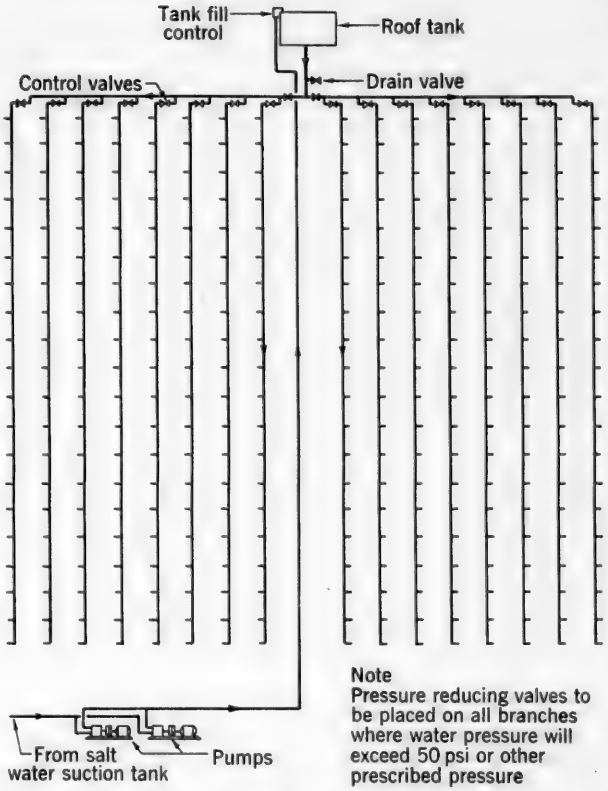

Tank fill control
Roof tank
Drain valve
Control valves
Note
Pressure reducing valves to be placed on all branches where water pressure will exceed 50 psi or other prescribed pressure
From salt water suction tank
Pumps

Fig. 5. Riser diagram for a roof tank gravity system.

because it is so important that the engineer carefully check this matter with piping manufacturers. This is the only way in which some reasonable degree of assurance can be gained on the performance of the particular material specified. This same attention must be given to the pumping equipment as well as the valves and other component parts of the building's salt water distribution system.

Typical Hotel Room

For reasons of economy, bathrooms in a hotel are generally placed back to back when practical. A typical arrangement of two hotel rooms is shown in Fig. 6. Here is shown how the salt water piping may be arranged to serve the bathtubs and the water closets.

Detailed Arrangement of Piping

Figure 7 shows a detailed arrangement of all the piping that might be installed to serve the fixtures in a hotel bathroom. Although a singular arrangement of piping has been shown for the sake of clarity, the arrangement for a back-to-back bathroom would be very similar in that branch connections would be extended to supply the back-to-back fixtures.

In this instance, all the plumbing waste, vent and water facilities have been shown to offer a realistic picture of the piping arrangement. Note that cold salt water is supplied to the water closet flush valves. This provision is entirely up to the engineer. This specific application has been included because the salt water is available and certainly reduces the quantity of cold fresh water that would otherwise be wasted for this purpose. Whether salt water is to be used for this function is a factor that must be carefully considered by the

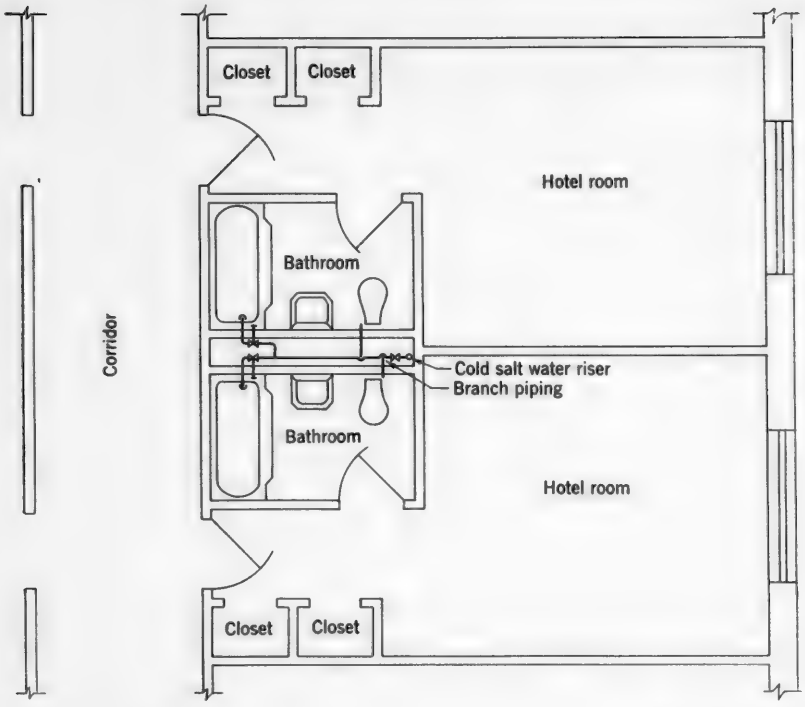


Fig. 6. Typical arrangement of hotel room showing how cold salt water piping is installed.

engineer. If the hotel must obtain its own fresh water from deep wells, the use of salt water for flushing purposes is a very definite advantage. In any event, the merits of this water saving provision are worthy of attention.

Salt water is supplied to the bathtub but is controlled by a separate valve and is dispensed into the tub through a separate spout. The reason for this separation is to avoid any cross connection with the fresh water supply. A salt water showering arrangement has not been included since most persons seeking the benefit of salt water fill the tub. However, if a salt water shower is desired it can also be accomplished as a separate arrangement.

Pipe Covering

The salt water riser piping should be covered with an anti-sweat pipe covering to avoid dripping lines. In fact the same consideration given the fresh cold water piping shall apply to the cold salt water piping.

Summary

Since salt water distribution systems are not a frequent design experience, it is hoped that the suggestions offered will be of some help. The system may be utilized for a hotel or motel. To provide an adequate system, it is necessary only that the same thought be afforded as would be given to the design of a fresh water distribution system.

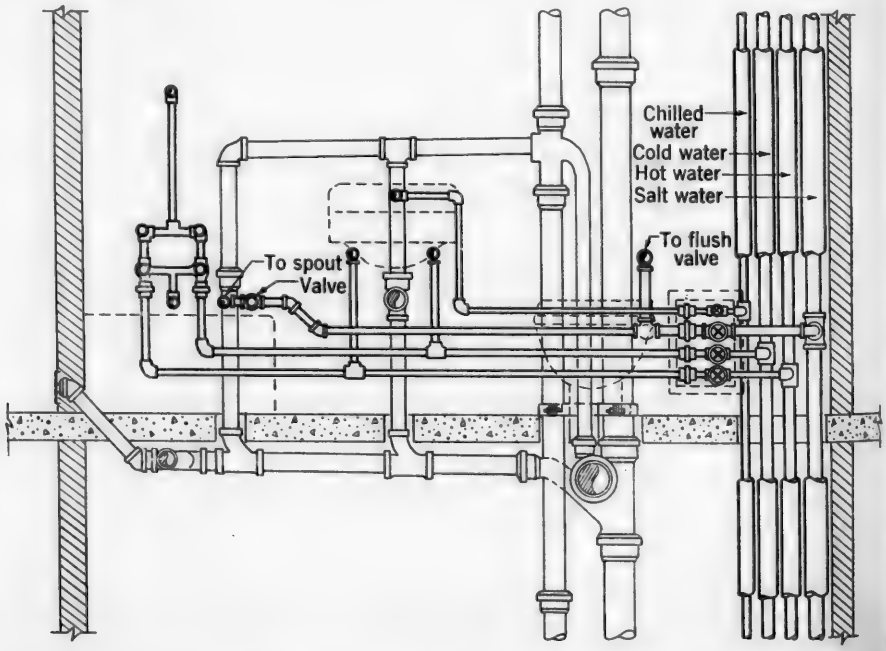


Fig. 7. Arrangement of waste and water facilities, including cold salt water piping.

PRODUCT APPLICATIONS

New, Unusual, or Ingenious Uses of Equipment and Materials

Control Center Enables Hospital Patients To Handle Routine Tasks

An automatic bedside control panel that puts command of a dozen comfort-type services right at a hospital patient's fingertips has been developed by Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. From a flat-on-his-back position the patient can—by merely flicking switches, pushing buttons or twisting knobs—use the robot "genie" to perform a variety of tasks

The control center was developed in collaboration with hospital officials to help reduce increasing costs of patient care by freeing the nurse from many bedside tasks. It also keeps the patient happy by avoiding long delays in receiving such services in crowded hospitals. In addition, a company official points out that the control center is the first completely integrated system to apply, by mechanical means, the "self-help" concept to patient care.

Here are some of the things the control center enables the patient to do automatically for himself:

Raise or lower the height of a motorized bed; also raise or lower both the head rest and the knee rest.

Open and close motorized drapes on the room's windows.

Turn bedside electric lights on or off.

Regulate the room's heating or air conditioning.

Operate a closed circuit TV setup, as shown in photo, for such uses as room-to-lobby viewing so that the patient can see and talk with children or other visitors not permitted in the hospital room.

Select any commercial TV program and adjust tuning, contrast and volume from pillow speaker.

Operate a radio, selecting different channels that may be piped into the hospital.

Converse with the nurse, while she is at her station, via a two-way intercom.

The control setup also includes a new-type automatic telephone, a self-contained one-piece instrument with the dialing section built into the bottom of the hand-piece.

Six Ammonia Compressors Cool Concrete

Concrete gives off heat as it "sets"—an undesirable trait when millions of yards of concrete are involved.

Six reciprocating ammonia compressors at the Glen Canyon Dam, in Arizona, were coupled to 600-hp synchronous motors, supplied by Electric Machinery Mfg. Co., Minneapolis, Minn., to provide chilled water to meet this problem.

First, the cool water is sprayed on the concrete aggregate (sand and gravel) cooling it prior to its being mixed with cement; this reduces the temperature of the concrete mix.

After the concrete is poured, further cooling is accomplished by circulating chilled water through pipes in the dam.

Rubber Shock Cords Absorb Contraction Of Ice Rink's Plastic Pipe

Using plastic pipe, maximum recreational utility was realized in the Kalamazoo (Mich.) Parks Department's newest skating rink. Eleven miles of polyethylene pipe, manufactured by National Tube Division of U. S. Steel, makes possible year-round use of the rink.

The system uses 3,700 gal of brine which is circulated through the plastic pipe at 35 pounds pressure. The thin-wall pipe is rated at 65 psi at 75 deg F, and 125 psi at 5 deg—well in excess of designed working pressures.

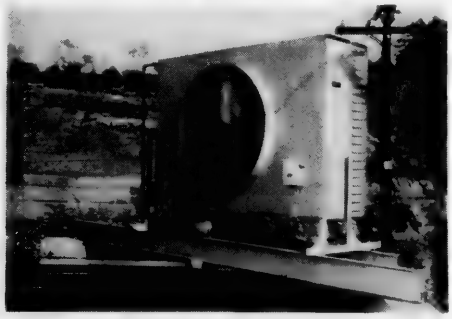
Expansion and contraction in the plastic pipe is absorbed by rubber shock cords, shown in photo, connected to hooks on the rink rim. Pipe contracts approximately 12 inches in each 185-ft loop. In warm weather the shock cords are disconnected to permit removal of the plastic refrigerant pipe, and the rink's smooth floor can then be used for roller skating or dancing.

NEWS OF EQUIPMENT AND MATERIALS

Use the convenient prepaid postcard appearing on the last page for securing additional information about new equipment and materials described in this department.

Higher Capacity Condensers

Expansion of its AC Line of air-cooled condensers with ten new models is announced by Halstead & Mitchell, Pittsburgh, Pa. Capacities from 30 to 100 tons are now available. Use of larger tonnage units on the bigger installations will simplify piping in the field necessitated



by multiple units and thereby save on initial costs, the company points out.

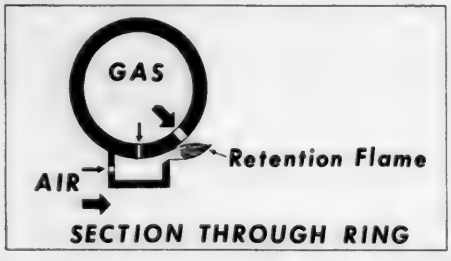
Basic units range from 30 to 50 tons. Twin units, with necessary manifolding provided for their interconnection at job site, are 60, 70, 80, 90 and 100-ton capacities.

The entire line now consists of 18 propeller fan models ranging from 3 to 100 tons nominal capacity, covering a wide range of suction, condensing, and entering air temperatures. The 30-ton model illustrated, shown atop a supermarket, is one of those described above.

More information? Circle Item 1, postcard, last page.

Integral Pilot Flame

Announced by The Webster Engineering Co., Tulsa, Okla., is the Webster Flame Retention Ring gas burner offering positive, continuous ignition under all conditions. Unit incorporates a unique application of the so-called "stick-tight" burner nozzle principle to the formerly unstable ring gas burner.



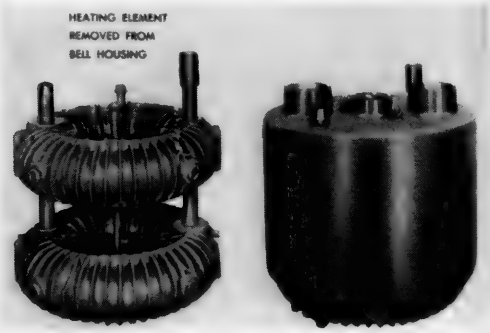
There is no total pre-mixing. A small percentage of the raw gas enters the annular space under the retention band, as illustrated, and is there mixed with air entering through the weeper ports on the back side of the band. The ribbon of flame produced at the exit of the annular space furnishes constant ignition to the main gas supply without regard to flow conditions of either gas or air. Tremendous inputs are said to be possible in small spaces, and combustion is reported quiet and stable at all rates of air flow from high excess to a deficiency.

Packaged burner units based on this principle are illustrated in literature which is available from the manufacturer.

More information? Circle Item 2, postcard, last page.

Speeds Heavy Oil from Storage

A tank suction bell heater with 12 sq ft of heating surface in a cylindrical bell 15¼ inches dia by 16½ inches high is developed by Davis Engineering Corp., New York, N. Y. Heater is designed to speed withdrawal



of No. 6 fuel oil from tank storage, while installing through a tank manhole as small as 16 inches.

Dome-shaped housing (the bell) opens at the bottom to expose cast finned heating sections. Attached to the oil suction line, the heater rests on the bottom of a No. 6 fuel oil tank. Steam, hot water, or other heat transfer media are used.

More information? Circle Item 3, postcard, last page.

U-Bend Heat Exchanger Tube

U-bend heat exchanger tube, in many standard and custom gages, diameters, and lengths, is available directly from Chase Brass & Copper Co., Waterbury, Conn. It is presently manufactured in a choice of uniform gage, with thickened centers, or with thickened ends, depending upon specific requirements.

Factory fabrication of U-bend tube is said to offer many advantages to users by eliminating handling and equipment costs for on-site bending, and by eliminating excess scrap and unnecessary handling and storage. Tube is bent, trimmed, hydrostatically tested, and reamed prior to shipment. Tubes are shipped palletized, and with sizes arranged and labeled for optimum speed in on-site operations, the company states.

Standard U-bend tooling will accommodate straight lengths up to 75 ft in gages of 0.049, 0.065, 0.083, 0.095, and 0.109 inch, in four diameters and many radii. Dual gage heat exchanger tube is also available.

More information? Circle Item 4, postcard, last page.

Telescoper Reaches High

A 500-lb capacity, electrically elevated, high-reach telescoper for installation or servicing of piping, ductwork, unit heaters, or ventilators at heights up to 42 ft, is available from Economy Engineering Co., Chicago., Ill. It simplifies a multitude of chores while enhancing safety, the company states.

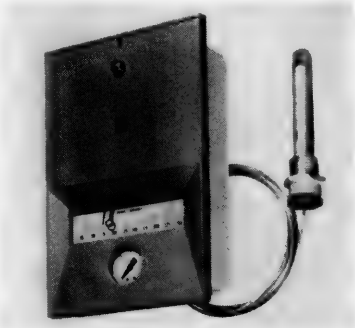
The unit includes dual elevator-type cables and numerous other electrical and mechanical safety features. Telescoping mechanism operates on a-c current. Compactly constructed, the unit fits through normal doorways. For additional convenience, the unit can be furnished self-propelled.

More information? Circle Item 5, postcard, last page.

Indicating Controllers

Minimum air usage, cartridge components, and improved readability are advantages of a new series of compact "thin-line" temperature and pressure controllers for heating, ventilating, and air conditioning applications.

Called Series 200, the indicating pneumatic control instruments are made by The Powers Regulator Co.,



Skokie, Ill., and are available in three temperature and four pressure ranges for stock delivery. Other specifications are available on longer delivery.

The controllers are used with diaphragm-operated valves for gradual accurate regulation of temperature or pressure. Changes are sensed by a remote nitrogen-filled bulb connected by a capillary to the controller (For pressure control, a pressure spiral element is used.) These changes are relayed by the controller to the valve, which modulates the heating, cooling, or pressure medium to keep the process at the desired point.

More information? Circle Item 6, postcard, last page.

Cellular Pipe Insulation

A preformed, closed-cell tube and pipe insulation is announced by Presstite-Keystone Engineering Products Co., of St. Louis, Mo., a division of the American-Marietta Co. Under the tradename Presst-O-Cel, the product has been designed to stop condensation, insulate against heat loss, and serve as a vapor barrier.

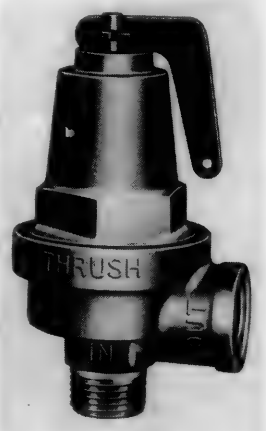
Made of expanded Neoprene, the tubular insulation has a k factor of 0.30 at 10 deg F. Qualities reported for the insulation include perfect water and air tightness; oil, acid, and alkali resistance; long life; and non-support of combustion.

Insulation is packaged in convenient 6-ft lengths. It comes in ½-inch wall thickness for standard pipe sizes from ⅜ to 2½ inches.

More information? Circle Item 7, postcard, last page.

Water Pressure Relief Valves

Series 39 water pressure relief valves, furnished in low- and high-pressure settings and available with or without lever, are offered by H. A. Thrush & Co., Peru, Ind. The company states that though they are very low in cost, valves are manufactured to high standards and will give many years of trouble-free protection.



Model 39, without lever, and Model 39L, with lever, are 30-lb valves for hot water space heating systems. Model 39H, without lever, and Model 39HL, with lever, are furnished with settings of 45 to 150 lb for domestic storage water systems. Inlet and outlet connections are ½ inch. In addition to brass body and all-brass working parts, valves have heat-resisting diaphragms and high temperature silicone seats.

More information? Circle Item 8, pastcard, last page.

Electric Radiant Heater

Type SKR ceiling mounted Chromalox electric radiant comfort heater, announced by Edwin L. Wiegand Co., Pittsburgh, Pa., is suitable for general application but especially recommended for hard-to-heat spots, particularly where overall room temperature cannot be maintained. Comfort is induced by direct radiation on individuals and surroundings, such as desks, work benches, machinery, and the like, which in turn become generators of radiant heat.

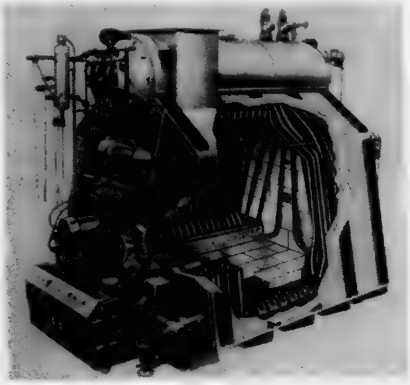
Heaters are equipped with two fixture stems which provide minimum 12-inch spacing below combustible ceilings. Each stem has a canopy and fixture for attachment to standard conduit box. Addition of company's input controller enables precise dialing of one or a number of units to suit individual preferences. Also, thermostats are available that work through the input controller.

More information? Circle Item 9, postcard, last page.

Packaged Water Tube Boiler

Superior Combustion Industries, Inc., New York, N.Y., announces an addition to its line of fully packaged boilers. The new unit, designated as Model AS, is being built in capacities ranging from 4000 to 13,000 lb steam per hr. The basic construction of the boiler is the Type A tube arrangement.

Efficient heat transfer, without baffles and gas collecting pockets, and protection for refractory has been achieved, the company reports. Tangent tubes in the furnace wall eliminate refractory baffle between the furnace and convection tube pass of boiler.



The mechanical draft fan is mounted at the rear of the boiler, leaving the firing front uncluttered and providing positive air cooling of the furnace floor and the front firing wall. This also results in more uniform air supply to the burner and better flame formation. Rotary burners are standard on all sizes, providing fully automatic operation, maximum safety, with minimum supervision. Other features include factory installed and piped soot blowers; air shielded, air cooled observation opening which allows full width viewing of the furnace without danger to the operator; and complete controls mounted to the boiler front and easily accessible without the use of a platform.

The boilers are completely factory assembled and fire tested before shipment. They arrive at the installation site complete even to refractory, insulation, and steel jacket. According to the manufacturer, they require no special foundation other than their own structural steel base.

More information? Circle Item 10, postcard, last page.

Extra-Long Baseboard Lengths

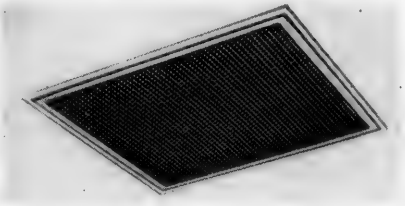
Beautybase baseboard radiation is now available in extra-long lengths, in addition to the standard 10 ft series and the short-length telescoping series previously made, reports the manufacturer, Continental Manufacturing Co., Baltimore, Md.

The complete line now embraces enclosure panels from 3 to 16 ft, in increments of 1 ft. The longer lengths allow the installer to place only one panel per wall without splicing. This feature, together with the lock-in enclosure brackets and the snap-on accessories, greatly reduces installation time and allows the exact job requirements to be ordered.

More information? Circle Item 11, postcard, last page.

Perforated Air Diffusers

Air Devices Inc., New York, N. Y., announces a series of Perfair perforated air diffusers with matching return or exhaust units. The air diffusers incorporate interchangeable cores available in unlimited air pattern arrangements for 1-, 2-, 3-, or 4-way blows. These units also include built-in air controllers for positive adjustment of air deflection after the unit is installed.

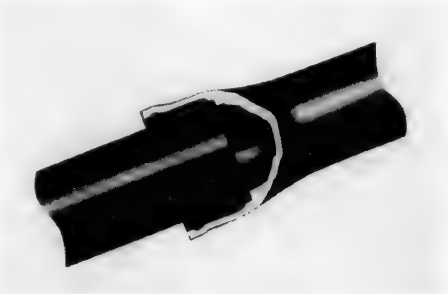


The perforated face plate of the diffusers blends in with acoustical ceilings. Matching return or exhaust units harmonize perfectly to enhance the architectural design, according to the company. Separate mounting frames permit quick and easy installation of supply or return units.

More information? Circle Item 12, postcard, last page.

Cast Iron Soil Pipe

Tyler Pipe & Foundry Co., Tyler, Tex., has made its own adaptation of the production-proved Swedish Akers System which is particularly suitable for producing 10-ft soil pipe. In this system, the pipe is centrifugally cast in metal molds. According to the company, the only



domestic firm licensed to use this method, the resulting product is exceptionally clean and smooth, inside and out, and extra strong where the hub joins the barrel. Uniform thicknesses are assured.

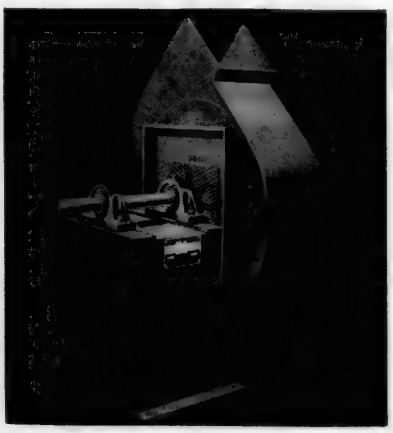
Tyler Longs are twice the length of regular cast iron soil pipe. This reduces the number of joints to caulk, saves time, and saves material costs. The self-centering ring in the hub simplifies caulking, insures perfect alignment, and provides a more water-tight joint.

Uses include vent stacks, in residential and commercial buildings; long runs, such as house-to-city sewers and industrial waste lines; and down spouts, in large commercial and industrial buildings at one joint per floor.

More information? Circle Item 13, postcard, last page.

Flat-Bladed Fans

Three types of general industrial fans for operation from minus 300 to plus 1000 deg F are announced by The New York Blower Co., Chicago, Ill. According to



the manufacturer, they incorporate advanced aerodynamic techniques that combine improved efficiency with the advantages of flat radial blade design. Heavy construction and extra-heavy bracing provide stable performance.

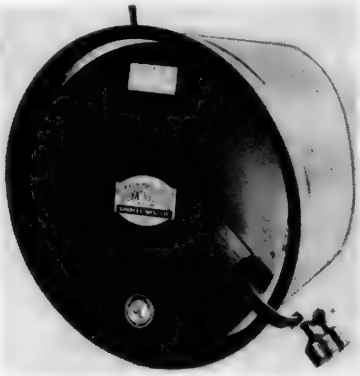
Type LS is designed for coarse materials and abrasive particles, and are recommended for sticky, heavy, or abrasive dust problems. The flat radial blades are easy to clean and will withstand corrosive or heavy fumes at temperatures to 800 deg.

Type RIM is similar to Type LS, but blades are connected at their tips by a rim that permits operation at temperatures up to 1000 deg. Type LM fans are designed to handle smoke, gases, or air containing small quantities of fine dust. Efficient fume removal is said to be provided to 800 deg. The new line is fully described in bulletins offered by the company.

More information? Circle Item 14, postcard, last page.

Automatic Draft Control

Re-design of its Type H-HG Sim-Trol automatic draft control by its manufacturer, Simplex Mfg. Co., Fond du Lac, Wis., is said to provide full control of draft intensity as well as 100% back pressure relief from any cause. Though made for small boiler installations, nothing is sacrificed in construction, the company states.



Units are available in all sizes from 6 to 24 inches, inclusive, and are recently available as a combination control for coal-oil-gas-fired plants. Use of one control for all types of fuel will simplify inventory problems. When used for coal- or oil-fired plants, the stop at the top of the control is turned downward to limit the gate action to draft control only. When used with gas-fired equipment, the stop is turned upward to provide dual action of the gate.

According to the manufacturer, all Type H-HG units may be installed on the side or under the breeching, the latter placement providing a combination unit of draft control and horizontal down draft diverter or hood.

More information? Circle Item 15, postcard, last page.

Ignition Electrodes

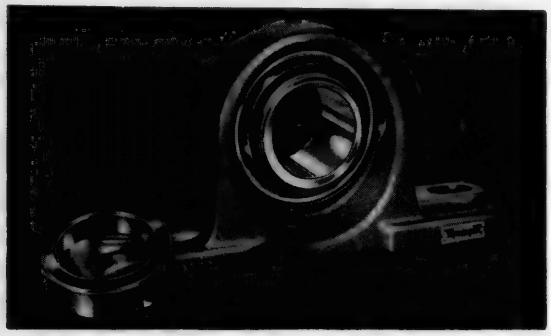
Ignition Components Co., Inc., Bloomfield, N. J., announces I-CEE ignition electrodes for domestic and industrial applications in oil or gas burners.

Every type of tip, whether standard or custom design, will be completely manufactured in the plant. This includes ceramic insulator bodies, high-chrome alloy steel rods, and brass terminals.

More information? Circle Item 16, postcard, last page.

Ball Bearings Improved

Two series of relubricatable ball bearing pillow blocks with improved seals, a redesigned housing, and lower prices are introduced by The Fafnir Bearing Co., New Britain, Conn. Units are designated as the LSA or Standard Series and the LSAO or Heavy Duty Series. Both lines incorporate integral seal bearings.



The newly-designed housing combines greater strength with an overall streamlined appearance, the company states, while prices on both series have been reduced below those of the company's existing SA and SAO lines.

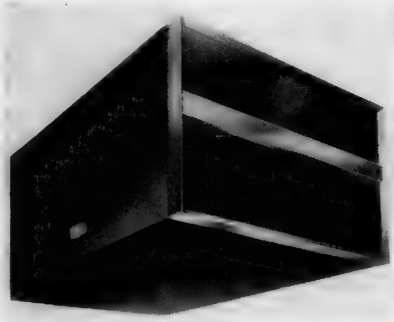
All LSA and LSAO units will have the same base-to-center-height dimension and bolt hole spacing as the SA and SAO lines respectively. The LSA series will be offered in sizes up to and including 2-15/16 inches; the LSAO up to and including 3-15/16 inches. The two new series, although offering distinct improvements, will not immediately obsolete the older SA and SAO lines.

More information? Circle Item 17, postcard, last page.

Low Side, No-Draft Units

Air conditioning air handling units in 3-, 5-, 8-, 10-, and 15-ton capacities designed with an improved "free-throw" plenum chamber and with a simply installed heating coil accessory, are introduced by Typhoon Air Conditioning Co., Brooklyn, N. Y., division of Hupp Corporation. Units may be suspended from the ceiling or recessed into the wall.

Designed for free-throw or ductwork installation, the



plenum used for free throw distributes air effectively without drafts, the company states. Large-capacity blowers overcome aid resistance in duct work installations to provide full rated cooling.

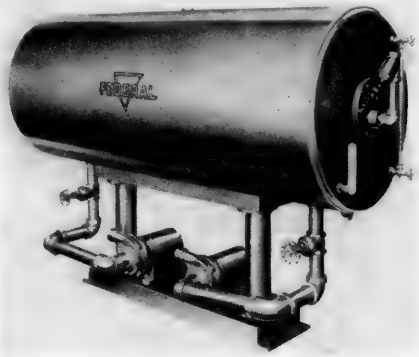
The units may be used with water cooled or waterless air conditioning, or as parts of chilled water systems. Available with hot water or steam coils, the units may also be used for heating.

Accessory heating coils are designed for easy installation and with the same attractive finish as the unit itself: a soft-textured, tan, baked enamel. Filters are installed on the rear of the heating coils so that air is cleaned before it enters the coils. Only the joining of piping lines is required to complete the heating installation.

More information? Circle Item 18, postcard, last page.

Boiler Feedwater Units

BFC boiler feedwater units, developed specifically for low pressure boilers, are announced by Federal Pump Corp., Brooklyn, N. Y. They are manufactured for simplex, duplex, and multiple installations and are of the



completely assembled, horizontal type. They are said to perform well in industrial, commercial, and residential installations.

Units receive return condensate from the system, supply make-up water to automatically maintain correct boiler feed water level in receiving tank, and pump water to boiler to maintain automatically the proper boiler water level by means of a boiler water level pump controller. Pumping rate is approximately three times the rate of evaporation for the indicated boiler horsepower. Bulletin 127 contains all details, specifications, and engineering selection data.

More information? Circle Item 19, postcard, last page.

Strainers for 600-Psi Steam

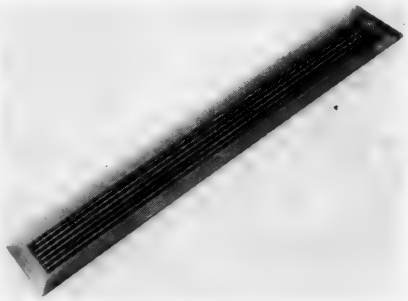
A line of pipeline strainers made of ductile iron is produced by Strong Steam Specialties Div., Strong, Carlisle & Hammond, Conneaut, Ohio. These strainers are said to withstand pressures of 600 psi at 650 deg F, providing 80% of cast steel service at roughly half the price. They are available for standard pipe sizes from 3/8 to 2 inches.

According to the manufacturer, ductile iron strainers will bend or twist, but not break, in case of fire or explosion, making them particularly adaptable in applications where the strength of cast steel has been previously required.

More information? Circle Item 20, postcard, last page.

New Grille Line

A line of all-aluminum extruded Airline Grilles, designed to match a wide range of architectural finishes, is developed by Waterloo Register Co., Inc., Waterloo, Iowa. The grilles are available in one-piece continuous construction up to 12 ft long and are designed for use in many locations, including floor, sill and wall.



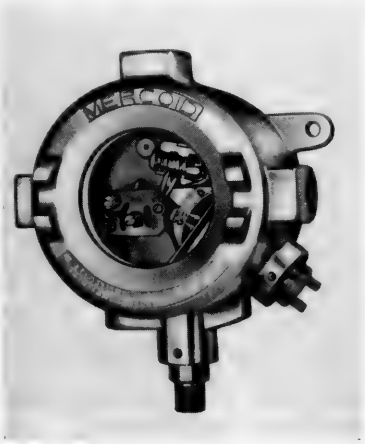
Grilles are suitable for these applications because a bar-support method makes them practically tamper-proof, the company states. This method involves integral construction of bars and supports incorporating the use of aluminum rods that tie the grille work securely to the frame.

Included in the line are grilles designed for use as return or exhaust grilles, or as supply grilles in heating and air conditioning in either sill or floor installations, or for sidewall applications, including those where there are ceiling obstacles to air distribution. A comprehensive selection guide prepared for use by architects, engineers, and contractors is available.

More information? Circle Item 21, postcard, last page.

Explosion-Proof Pressure Control

Announced by The Mercoid Corp., Chicago, Ill., is an explosion-proof pressure control for use in hazardous locations. It is listed by Underwriters Laboratories, Class



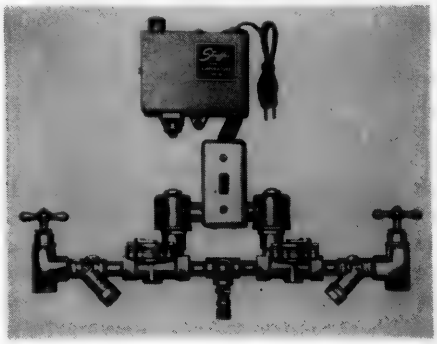
1, Group C and D; Class 2, Group E, F, and G; NEMA 7-9, 9A.

The control is designed to be used where space and weight are important considerations in control installations. Features include external adjustments for setting operating range; visible hermetically sealed mercury switch which shows at a glance whether switch circuit is on or off; and ½-inch external pressure connection with ¼-inch internal pressure connection. Finished in natural aluminum, control is available in 21 operating ranges from 0.30 inches vacuum to 0-1000 psi.

More information? Circle Item 22, postcard, last page.

For Photographic Solutions

An automatic water jacket temperature control valve, Model 14, is announced by Stouffer Graphic Arts Equipment Co., South Bend, Ind. It consists of a thermostat, two electrically operated valves, one for the hot, and one for the cold water line, strainers, discharge tube with jet nozzle, and necessary fittings.



It is claimed that this control will maintain a uniform temperature of photo processing solutions within 0.1 deg F. The control has many other laboratory applications since it may be set at any temperature between 10 and 90 deg. Thermostats for higher or lower temperatures are supplied to order.

In operation, the control valves automatically introduce hot or cold water intermittently into the water jacket or tank as required. The jet is designed to cause great turbulence and completely mix the water jacket periodically. Because a continuous flow of water is not necessary, this control is said to be economical to operate.

More information? Circle Item 23, postcard, last page.

Duct System Materials

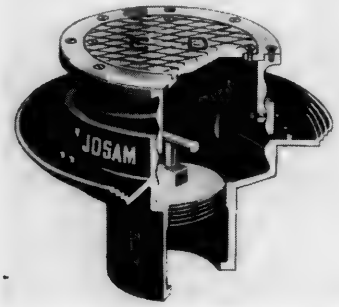
Introduced for residential and commercial duct systems is Fiberglas rigid insulation with a vapor barrier of thick embossed aluminum foil adhered with a flame-resistant adhesive. The duct materials, manufactured by Owens-Corning Fiberglas Corp., Toledo, Ohio, in rectangular and round sizes, provide both the duct system and the insulation in one product.

Because the rectangular ducts are actually flat prescored insulation boards, ready for folding into duct sections, they both deaden undesirable noise and permit high velocity of heating and cooling air. The aluminum foil, bonded to the exterior of the ducts, serves both as a vapor barrier and as a tough exterior finish.

More information? Circle Item 24, postcard, last page.

Adjustable Top Floor Cleanout

Designed for installation on sewer cleanout risers, the Leveleze floor cleanout has a rolled thread adjustable top which can be raised or lowered to permit the floor plate to meet the finished floor level, according to the



manufacturer, Josam Manufacturing Co., Michigan City, Ind.

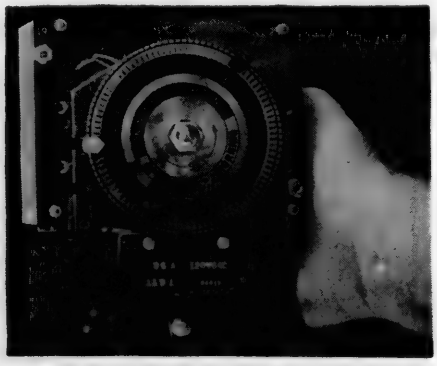
Cleanout has a cast iron body, and an internal plug which provides protection against back flow from sewers in areas subject to periodic floods. This plug is easily removed to permit drainage.

The cleanout can be furnished with either of the words *SAN* or *STORM* in addition to the letters *CO* cast in the cover. This identification permits maintenance men to differentiate between sanitary and storm sewers when lines become clogged. This is particularly advantageous where storm and sanitary sewer lines run parallel to each other.

More information? Circle Item 25, postcard, last page.

Keeps Going When A-C Fails

Automatic time switch controls for heating systems, that will continue to operate for extended periods during power outages, are announced by Heating Controls Div., Tork Time Controls, Inc., Mount Vernon, N. Y. Called



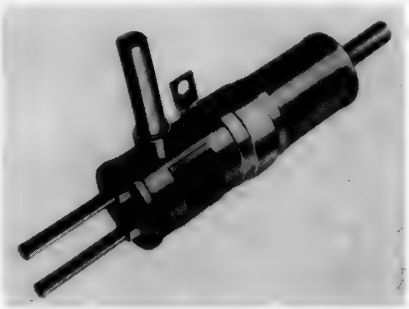
Reserve Power controls, they are available in both seven-day models and in units that provide for week-end omission.

Reserve power is supplied by an electrically wound spring. The spring is released and rewound daily to keep it in good condition. According to the manufacturer, time control switches without reserve power are out of phase when power is restored, delivering heat at the wrong times. In the case of the new models, however, with power resumed, there is normal operation of the heating system. Outages up to 17 hr or a series of shorter outages within that time are accommodated. Spring is rewound automatically after each outage.

More information? Circle Item 26, postcard, last page.

Sample Fluid Cooler

Model SSLC-225 sample fluid cooler with a stainless steel heat transfer coil is announced by Young Radiator Co., of Racine, Wis. This newly designed version, incorporating a Type 316 stainless steel coil, is available



for control testing purposes in chemical processing plants, paper mills, boiler systems, and laboratories.

The stainless steel heat transfer coil permits the handling of fluids, vapors and gases too corrosive to be handled by the copper alloy coil of the Model LC-125 standard cooler. The new cooler will reduce temperatures from 600 deg F to 100 deg at working pressures up to 2500 psi.

More information? Circle Item 27, postcard, last page.

Refrigerant Charging Manifold

Ansul Chemical Co., Marinette, Wis., introduces a lightweight, flexible charging manifold for use with its packaged refrigerants. The manifold has a three-way valve and coupling arrangement which permits the use of one, two, or three cans of packaged refrigerant.

Charging manifold is designed for use with virtually any type of canned refrigerant. The serviceman can control the discharge of refrigerant by the three separate valves, saving the unused cans for future use.

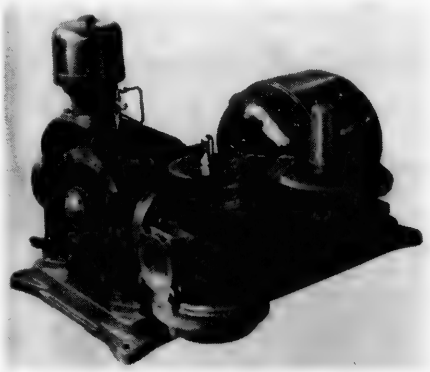
Included in the kit are the valve and coupling mechanism along with a charging hose. Single units are available if only one can of refrigerant is required. Any standard pressure gage can be inserted in place of the plug at the junction of the charging hose and the three couplings.

More information? Circle Item 28, postcard, last page.

For Use When Gas Fails

To maintain heat processing operations, space heating, water heating, cooking or refrigeration during periods of fuel cutoff, Selas Corp. of America, Dresher, Pa., is marketing a propane diluter which automatically supplies accurate mixtures of propane and air, or butane and air.

Available for small, medium and large installations,



propane diluters provide simplified interchangeability without having to adjust appliances or gas burners, the company states. They can be connected to existing gas piping and eliminate the need for dual piping, separate air blowers, inspirator mixers, or the like.

Unit incorporates a balanced pressure, full-floating mixing valve with precision-machined gas and air metering ports. The valve is adjusted through a vernier type worm-wheel mechanism for precise control of gas-air ratio and is capable of turndown through a range of 50:1.

More information? Circle Item 29, postcard, last page.

Vacuum Inlet for Chalk Dust

The addition of Trayvac built-in vacuum chalkboard-tray inlets to the firm's lines of engineered housekeeping appliances is announced by H-P Products, Inc., Louisville, Ohio.

Designed for rapid removal of chalk dust from trays

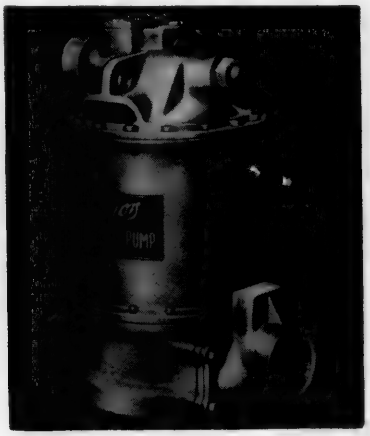
and erasers before it can contaminate the air or soil the floor, Trayvac can be installed on chalkboards in new or existing buildings equipped with a central vacuum system. All that is required are flat chalk trays to which inlet valves can be connected. For existing buildings not equipped with a central vacuum system, the manufacturer will make specific recommendations.

Dust in the chalk trays is disposed of by simply pushing it to an inlet valve with the eraser. Erasers are cleaned dustlessly by gently gliding them over an inlet valve.

More information? Circle Item 30, postcard, last page.

Air-Powered Sludge Pump

An air-powered sludge pump, No. 275, which can remove 42 gal of sediment-filled water a minute at a 175-ft head, is announced by Thor Power Tool Co., Aurora, Ill. It has no motor and its few working parts are stainless steel and automatically lubricated.



Designed for continuous, two-stage breathing cycle, pump draws in sediment by air suction until its tank capacity is reached, then automatically changes cycle to close the inlet valve, open the outlet valve, and expel the contents under pressure. It is capable of entering an opening 18 by 12½ inches, and can draw in water containing sand, rock cuttings, and other sediment up to 20-ft suction lift and deliver it up to 175-ft pumping head, company states.

More information? Circle Item 31, postcard, last page.

Powder Descales Water Systems

A powdered descaler called Super Scale Solve is announced by Magnus Chemical Co., Garwood, N. J., for removal of calcium carbonate and magnesium hydrate from heat exchangers, boilers, evaporators, and other types of water systems.

Because in powdered form, handling of concentrated liquid acids is avoided, thus minimizing the hazards of serious burns or fumes, the company says. Also, there are no carboys, deposits, and returns. Effectiveness of an 8-oz per gal aqueous solution is said to be equal to a 4.5% liquid acid solution. Light scale and rust formations are removed, while no appreciable action on sound metals will take place. Scale is converted to highly soluable salts.

According to the manufacturer, no special equipment is required for application: a built-in indicator gives visual control of solutions.

More information? Circle Item 32, postcard, last page.

New Split Case Pump Line

A line of horizontal split case pumps for hot and cold water handling, designated the AquaLine, is introduced by Peerless Pump Div., Food Machinery and Chemical Corp., Indianapolis, Ind.

Primarily designed for the general purpose applications of the building trades, these pumps are available in shaft sealed types in 1½ to 4-inch discharge sizes and in packing gland types in 4 to 8-inch discharge sizes. Capacity and head ranges of the packing gland types are up to 2600 gpm and up to 280 ft, respectively, and capacity and head ranges of the shaft sealed types are up to 950 gpm and up to 350 ft, respectively. Liquid temperature limits for the shaft sealed types is 180 deg F and for the packing gland types is 250 deg. Motor sizes range from 1 to 75 hp.

A horizontal split case design, with split at centerline of pump shaft, facilitates inspection and maintenance of rotating parts. All-bronze, enclosed type impellers are hand finished and balanced. Bronze case wear rings are replaceable. Included also are quality alloy steel shafting, machined all over to gage; and Alemite-fitted, grease lubricated ball bearings.

All pump sizes are to be carried in stock for immediate delivery by factory and district warehouses.

More information? Circle Item 33, postcard, last page.

Discs Control Air Flow

A unit ventilator, called the Praetorian, utilizes two aerodynamic discs for control. Announced by Valveblower Co. of California, Inc., Santa Fe Springs, Calif., the unit is available in two sizes with three coil arrangements each, for heating and cooling. A large range of capacities is now in production, for schools, offices, and commercial buildings, the company states.

Water valves play no part in controlling the unit. Two aerodynamic discs move axially along a center supported,

horizontal, hollow shaft. Space between them, one-half the wheel width, is constant. Each blower is a double-inlet, double-width unit. By this arrangement, each unit delivers the air quantity of a single-width wheel at any given time. When discs move to the left, the right side increases its air-handling capacity by the same amount as the other side reduces its air handling capacity. One side of each blower assembly draws fresh air only, the other, heated or cooled air only. Minimum fresh air intake can be fixed. Overriding room temperatures are said to be eliminated.

According to the manufacturer, special attention is given to quiet, trouble-free performance by provision of permanently lubricated bearings, hard anodized Dural shaft, and graphite-impregnated nylon bushings in all moving parts.

More information? Circle Item 34, postcard, last page.

Foil-Faced Duct Insulation

An incombustible, foil-faced spun mineral wool duct insulation is announced by Baldwin-Hill Co., Trenton, N. J. The material has been added to the company's complete line of insulations for heating and air conditioning ducts. It is designed specifically to provide a vapor barrier meeting "fireproof" building requirements,

and also to present an attractive finished appearance on exposed ducts without extra finishing steps. Composed of spun mineral wool, the insulation is faced on one side with embossed aluminum foil 0.0025-inches thick.

Foil-faced duct insulation comes in 24 x 48 inch semi-rigid sheets, 1, 1½, and 2 inches thick. Having a density of only 7 lb per cu ft, it is lightweight, easy to handle, and easy to cut with a knife to conform to curved and irregular surfaces. The material has a k factor of 0.24 at a mean temperature of 75 deg F, and will withstand temperatures to 150 deg.

More information? Circle Item 35, postcard, last page.

New Lab Fixture Line

What it describes as a highly specialized and comprehensive line of laboratory service fixtures is announced by T&S Brass & Bronze Works, Inc., Westbury, Long Island, N. Y. The company is well known as a manufacturer of plumbing specialties in the food service and institution fields.

Called Lab-Flo, the line is serviced by a full-scale sales-service organization, and the company is ready for full production and deliveries. Included are: fixtures, hose cocks, remote controls, and combination units for water, gas, and air. Detail drawings and catalog information are offered.

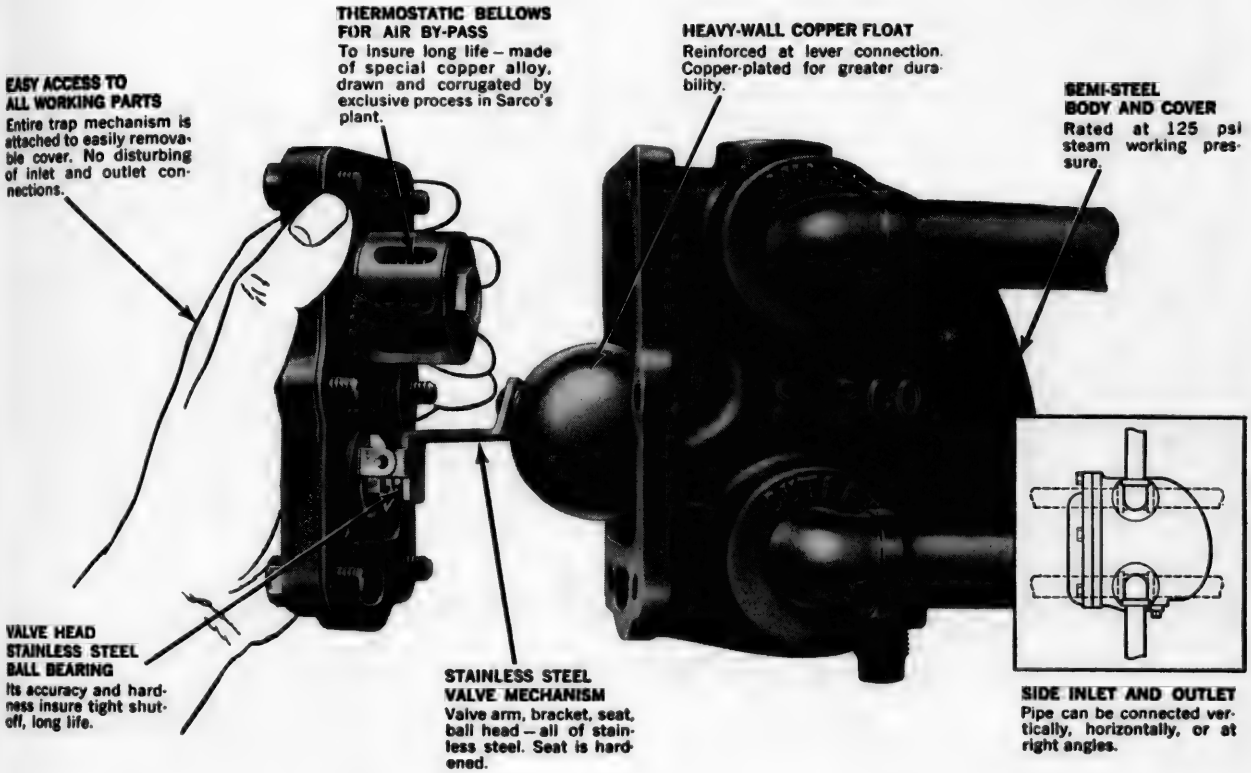
More information? Circle Item 36, postcard, last page.

(Continued on page 106)

Now...more trapping value for your money!

NEW SARCO FLOAT-THERMOSTATIC STEAM TRAP

with improved engineering features


EASY ACCESS TO ALL WORKING PARTS
Entire trap mechanism is attached to easily removable cover. No disturbing of inlet and outlet connections.
THERMOSTATIC BELLOWS FOR AIR BY-PASS
To insure long life – made of special copper alloy, drawn and corrugated by exclusive process in Sarco's plant.
HEAVY-WALL COPPER FLOAT
Reinforced at lever connection. Copper-plated for greater durability.
SEMI-STEEL BODY AND COVER
Rated at 125 psi steam working pressure.
VALVE HEAD STAINLESS STEEL BALL BEARING
Its accuracy and hardness insure tight shut-off, long life.
STAINLESS STEEL VALVE MECHANISM
Valve arm, bracket, seat, ball head – all of stainless steel. Seat is hardened.
SIDE INLET AND OUTLET
Pipe can be connected vertically, horizontally, or at right angles.

This new, improved Sarco Float-Thermostatic Steam Trap Type FT discharges condensate at steam temperature continuously and without shock.

Recommended to drip steam mains, unit heaters, blast coils, heat exchangers, and other allied process equipment, requiring accurate temperature control.

Air Binding Impossible – equipped with separate thermostatic air vent, which removes automatically and immediately all air and incondensable gases reaching trap. Balanced pressure vent self-adjusts to all operating pressures. Its location above condensate level permits discharge of air and gases reaching trap after start-up. Does not require adjustment when pressures change.

Sizes – ¾ and 1"
For steam pressures – 0 to 125 psi

Write for Bulletin 455-B to Sarco Company Inc., 635 Madison Avenue, New York 22, N.Y.

22108

SARCO

REMEMBER— only Sarco makes all types	Thermostatic Steam Traps	Liquid Expansion Steam Traps	Thermo-Dynamic Steam Traps	Float Thermostatic Steam Traps	Camlift Bucket Steam Traps

(Continued from page 104)

Installed Vacuum System

Forney Industries, Fort Collins, Colo., announces the purchase of Central Vacuum Systems Mfg. Co., and the complete redesign of the Miracle Aire installed vacuum system.

The vacuum cleaning system has three times the power of the best portable cleaners, the company states, requires filter replacement only once a year in ordinary service, and is fully automatic. Each room or area of the house or commercial building is supplied with plug-in outlets from which the 21-ft flexible hose can reach every nook and corner, floor to ceiling. When the outlet cover is raised, the cleaner automatically starts operating, and stops when the cover is closed.

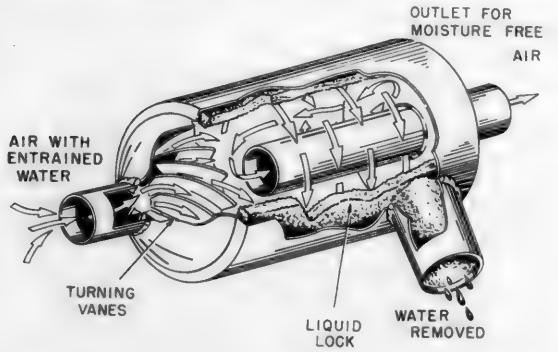
More information? Circle Item 37, postcard, last page.

Removes Free Moisture

A self-emptying moisture separator, without moving parts, said to remove under minimal pressure drop limits from 97-100% of free moisture from any gas stream, is announced by South Wind Div., Stewart-Warner Corp., Chicago, Ill.

The separator was developed for aircraft air conditioning, to prevent intolerable fogging in crew space or blinding condensation on windows, particularly during descent and landing. However, the company expects that the device has many applications unrelated to its original function. It is effective on such fluids as alcohol, ammonia, Freon, and to some degree on oils, and will remove moisture from any gas compatible with the materials from which the separator is fabricated.

Use of the company's Liquid-Lock wick material, first



employed in evaporative cooling equipment, and of specially designed vanes at the inlet of the separator, produce the high moisture removal efficiency of the unit. Its operation in removing moisture from an air line or stream is as follows:

As air enters a conical inlet, the vanes impart a spinning motion to it, causing the liquid particles to scrub the interior surfaces and bottom of the unit, where the air makes a U-turn before passing on through the unit. The wicking, used to line these surfaces, having a high affinity for any liquid, traps and retains the liquid particles, whatever their size.

The combination of (a) capillary action within the wick material, (b) centrifugal force created by the air turbulence set up by the vanes, and (c) internal pressure head, carries the liquid to a 4-inch column of wicking contained in a screened cylinder positioned at right angles to the body of the separator and the air flow.

When saturated with the liquid, this column releases the liquid to the outside, while at the same time acting as an air lock, preventing loss of air (and thus of pressure) from inside the unit. Thus the separation of moisture is accomplished regardless of attitude, and without the assistance of gravity, so long as the ambient pressure is less than the pressure of the air stream inside the separator.

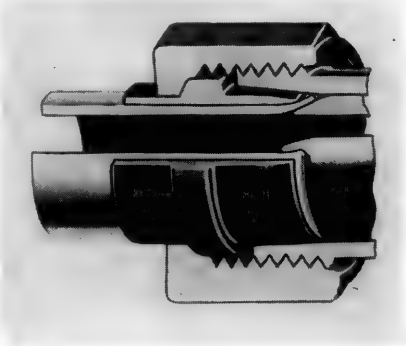
Since free moisture in this separator is kept in the wick material, tests are under way to determine performance of the unit with moist air entering at subfreezing temperatures. Preliminary tests indicate, the company states that continuing moisture removal appears feasible with a heating coil embedded in the wick material; during dry periods, the insulating qualities of the material will prevent excessive air reheat.

More information? Circle Item 38, postcard, last page.

Self-Flaring Tube Fitting

A self-flaring tube fitting, developed by Flodar Corp., Cleveland, Ohio, combines many of the advantages of both the standard flared type and the newer flareless type.

The fitting employs a hardened steel sleeve to press the tube into the contoured body to form a flare as the



fitting is tightened. In so doing, the fitting forms a pressure-tight seal on both the outside and inside diameters of the tube. A slotted skirt on the rear of the sleeve supports the tube, absorbing excess vibration.

In tightening the fitting, the nut comes to a "rock bottom" stop as a perfect seal is effected, preventing overtightening. Because of the nature of the seal obtained, the fitting can be re-used frequently without danger of leakage.

Fittings are available in all standard tube sizes from ⅛ to 2 inches and in all common styles. Materials available include steel, stainless steel, brass, and aluminum.

More information? Circle Item 39, postcard, last page.

(Continued on page 108)

"Now we can get rid of that stack"

New Petro FORCED DRAFT burner for smaller boilers (OIL, GAS OR COMBINATION GAS-OIL)

This advanced Petro forced-draft burner is as compactly built and service-free as your home oil burner; yet it delivers some surprising extra values.

First, built into it is a complete combustion system, with forced draft air supply, fuel systems and prewired integral control panel—all assembled and tested at the factory.

Second, it eliminates the need for a high stack, yet requires no induced draft fan.

Third, a burner head of new design cures the old problem of flame pulsation, in both gas and oil firing—in either natural draft or pressurized boilers.

Finally, it is available for either light oil or gas firing—or a combination of both—with instantaneous change of fuel under either automatic or manual control.

Available as a complete burner unit for easy application to any type of boiler, from 18 to 92 bhp. Also available in a complete boiler-burner unit (with Scotch boiler) delivered at site, ready for service connections. For full description and specifications, please mail coupon.

See Petro Catalog in Sweet's Architectural File

Makers of Quality Heating and Power Equipment since 1903

PETRO

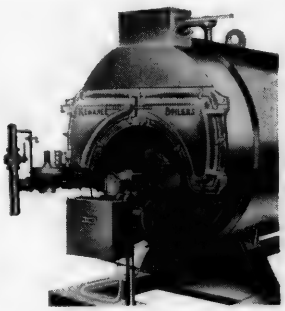
T. M. REG. U. S. PAT. OFF.

Forced draft... no stack or induced draft fan required.

No flame pulsation.

Single or dual-fuel firing.

Complete unit with Scotch boiler; or burner only for use with any type boiler.



PETRO
3230 West 106th Street
Cleveland 11, Ohio
(In Canada: 80 Ward Street, Toronto, Ontario.)

Please send me information on Petro P-240 Forced Draft Gas-Oil Burner.

Name .....

Company .....

Address .....

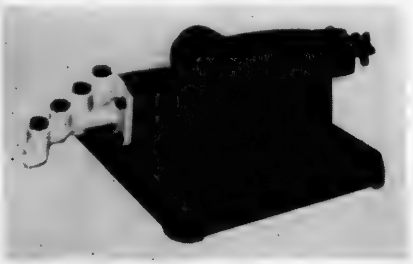
City .....State.....

(Continued from page 106)

Controlled Volume Pumps

A new line of controlled volume pumps for the chemical processing industries is being produced by Milton Roy Co., Philadelphia, Pa.

One design objective realized in the Milroyal controlled volume pumps is the use of a minimum of work-



ing parts and bearing surfaces to translate high speed rotary motion to low speed reciprocating motion. Totally enclosed, this speed reducer is an integral part of the pumps and runs in an oil bath. This combined Polar-Crank drive unit and speed reducer permits manual or automatic adjustment of capacity from 0 to 100%. The capacity adjustment closely approximates a liner relationship and can be made while the pump is running.

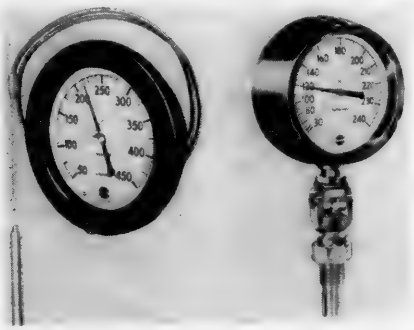
With liquid ends constructed of alloy steels for corrosion resistance, these pumps have maximum capacities to 29 gph, and will meter against pressures to 1900 psi.

More information? Circle Item 40, postcard, last page.

Full Line of Thermometers

A redesigned line of indicating dial thermometers announced by U.S. Gauge Div., American Machine and Metals, Inc., Sellersville, Pa., is available in a range from minus 350 to plus 1000 deg F.

Tradenamed Supertherm, line is complete in variations offered as to (1) remote or direct reading types; (2)



methods of ambient temperature compensations, where required; (3) filling mediums for different temperature ranges and uses; (4) case sizes, materials, and styles; and (5) thermometer bulbs of different sizes, shapes, and materials to suit application needs.

Remote reading models (left in photo) employ conventional capillary tubing up to 125 ft. Direct reading styles include a rigid stem type and a multi-angle type (right in photo). This last has a swivel mounting head which permits user to adjust dial face at any convenient angle. Its versatility of application reduces the number and styles necessary to be maintained in plant maintenance stock. Piping layout is simplified because the designer need not be concerned about allowances for the mounting angle.

More information? Circle Item 41, postcard, last page.

Improved Electric Humidifier

The Keeney Manufacturing Co., Newington, Conn., announces an improved electric humidifier for warm air furnace systems. Known as the Climatizer, the unit is constructed with a built-in heating element producing a vapor which rises directly into the air stream. No evaporation plates are used.

Unit has a float switch with completely enclosed rocker magnet which actuates a solenoid valve. The action of this foolproof switch positively controls the level of water in the aluminum body, the company reports.

The cover of the body has perforations which prevent the accumulation of crud. Regardless of water conditions, the cover keeps microscopic particles in colloidal suspension until exhausted in the vapor escaping through the holes.

Small and compact, the unit is packaged, ready for easy installation. Model 250 is wired to operate when blower is on; Model 251 is wired with electric plug for continuous operation.

More information? Circle Item 42, postcard, last page.

Motor Switch Sealed

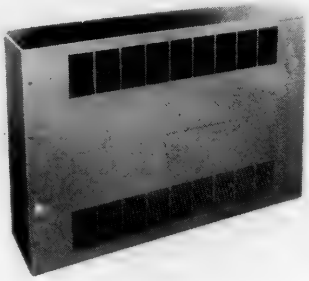
Introduction of a newly designed single-phase motor, featuring a totally incased starting switch package, should result in a sharp diminution of failures in air conditioning systems, according to the manufacturer, Electric Motor Div., A. O. Smith Corp., Tipp City, Ohio.

Over 34% of all single-phase motor failures in air conditioning systems have been caused by the accumulation of dust, dirt, and sand on motor starting switches in heating and air conditioning systems, playing havoc with the units, the company states. By totally enclosing the starting switch package—switch, capacitor, actuator, thermostat, and terminal board—such failures should be greatly reduced.

More information? Circle Item 43, postcard, last page.

Cabinet Unit Heaters

A new cabinet unit heater is announced by Kritzer Radiant Coils, Inc., of Batavia, Ill. Heaters are best adapted for areas calling for rapid concentration of heat or where heat losses are high, such as building entrances,



lobbies and foyers, according to the company.

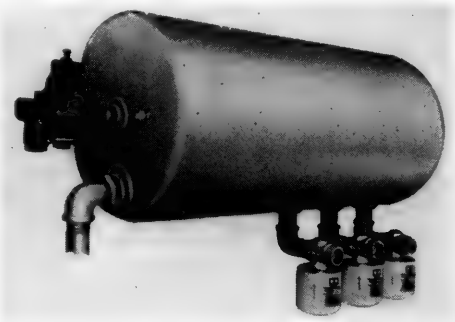
There are six basic sizes with standard or high capacity coils—500 to 1200 cfm—up to 430 EDR. They are only 32 inches high by 10 inches deep, and can be installed as floor, wall, inverted wall, or ceiling mounted. Trim strips, 3 or 4 sides provide for full or partial recessing.

The 1050-rpm motors with permanently lubricated bearings drive the tandem, double width, double inlet, aluminum centrifugal fans; 4-speed control is available.

More information? Circle Item 44, postcard, last page.

Hydronic Zone Control Tank

Availability to the hydronic industry of a zone control tank is announced by Continental Mfg. Co., Baltimore, Md. With it, the company states, it is possible to zone control any boiler with one simple installation. When in-



stalled with one to six zone control valves, the tank: (1) Acts as an expansion tank; (2) Collects the entrained air from system water; (3) Tempers water to system on circulator start; (4) Eliminates temperature shock and air noise; and (5) Pre-engineers zoned installations.

According to the manufacturer, this air eliminator tank with the new zone manifold will perform as a control point for any hot water installations and is as easy to install as an ordinary tank.

More information? Circle Item 45, postcard, last page.

Your ideas work better when you work with HONEYWELL

The following pages bring you the latest developments in automatic controls from Honeywell. They widen your choice of products, give you more to work with.

For complete information on these new control products and systems, call your nearest Honeywell sales office. Honeywell provides 112 offices throughout the country; each is staffed with capable control specialists to assist you in preparing proposals and writing specifications.

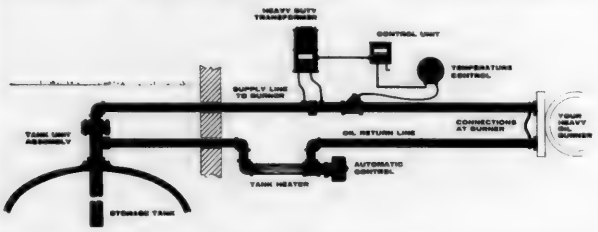
Look over these new products and systems. And, remember, they are backed by the kind of support only Honeywell can offer you.

FOR MORE TO WORK WITH ... WORK WITH HONEYWELL

Oil Preheating System

Development of an oil preheating system that employs electric pipe heating equipment is announced by Banner Engineering and Sales, Saginaw, Mich., a recently formed company.

System consists of transformer, immersion heater, thermostat, tank unit, control panel, and insulated unions.



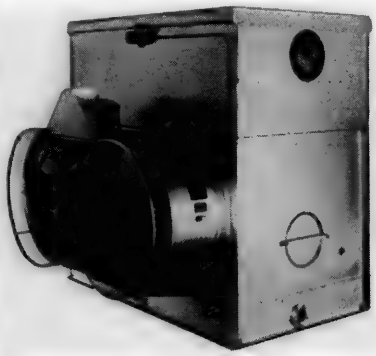
Suction and return line from storage tank to each burner are so arranged that oil within the pipe is heated at all times when electric current is passed through the pipe. Thermostat operates transformer to maintain oil temperature at 120 deg F during all conditions of flow or standby.

Equipment is guaranteed, the company states, to remove No. 5 or 6 oil from storage and make delivery of fuel possible to each burner. A brochure containing drawing and design data, as well as prices, is available.

More information? Circle Item 46, postcard, last page.

Flexible-Capacity Towers

Flexi-Tower is the trade name of a line of cooling towers announced by Baltimore Aircoil Co., Baltimore, Md., each unit of which can be adjusted over a very wide range merely by changing the spray pressure, the company states. No mechanical change takes place to effect



the capacity changes except an increase or decrease in pump size.

Of counterflow design, towers are factory-assembled, and of blow-through, propeller-fan design. The line covers a capacity range from 10 to 215 tons. A pressure gage is included for accurate calibration of spray pressures.

More information? Circle Item 47, postcard, last page.

Honeywell Supervisory DataCenter in Reynolds Metals Office Building, Richmond, Va., controls all ten of the air conditioning systems in the building.

Architect: Skidmore, Owings and Merrill; Project and Construction Managers: Ebasco Services Incorporated; General Contractor: George A. Fuller Company; Mechanical Contractor: Huffman-Wolfe Southern Corp.; Electrical Contractor: E. C. Ernst, Incorporated.

100,000 Lb per Hr Package

Series 100-OG natural circulation package boilers, said to be the first units of their kind capable of generating steam at capacities up to 100,000 lb per hr or more, is placed on the market by The Babcock & Wilcox Co., New York, N. Y. The company expects that they will cost purchasers 20% less than field-erected units.

Utilization of the principle of natural circulation is credited with much of the cost reduction, eliminating recirculating pumps and simplifying operating and maintenance problems. Over-all maintenance costs are also said to be minimized because practically the entire furnace and boiler envelope is water cooled.

Completely factory-assembled for shipment and installation, boilers are designed to operate at steam pressures from 250 to 775 psi. They are designed to burn either oil, gas, or the combination, and if a dual-fuel burner is used, the standby fuel becomes instantly available, since one fuel can be lighted with the other, avoiding any outage or drop in pressure when fuels are switched.

Fast, safe start-up is facilitated by the drainable superheater, which is cooled and protected from the hot flue gases with steam as soon as drum pressure is raised. This same arrangement also protects against freeze-up of outdoor installations when they are out of service.

More information? Circle Item 48, postcard, last page.

Gravity Roof Ventilators

An architecturally pleasing low silhouette is attributed to Vanco Roof-Line gravity ventilators, manufactured by E. Van Noorden Co., of Boston, Mass. They are designed to relieve pressure and to provide efficient

weatherproof ventilation over areas where positive exhaust exists.

Another advantage, according to the company, is the ventilating efficiency, positive flow of air in rated volume being assured by outlet opening 50% greater than inlet.

Aluminum or copper units are available in addition to standard units of galvanized sheet metal with angle iron framing. Wide choice of square and rectangular models is available in eleven throat sizes from minimum of 12 inches on a side to maximum of 60 inches. Dampers are usually not required, but are available with operating chain.

More information? Circle Item 49, postcard, last page.

*Honeywell Supervisory DataCenter**

supervises and controls 10 air conditioning systems in new Reynolds Metals Building!

The Honeywell Supervisory DataCenter shown on the facing page is installed on an aluminum panel in a special control room at the new Reynolds Metals Company Office Building in Richmond, Virginia.

From this central location the building engineer has complete supervision and control of the critical temperatures in the building's 10 air conditioning systems. The DataCenter supervises the heating plant, refrigeration system, exhaust air systems and some 79 critical space temperatures throughout the building.

In this Reynolds Metals Building, as in the 350† other Honeywell Supervisory DataCenter installations throughout the country, the controls, instruments and central panel were all manufactured, installed and guaranteed by Honeywell—benefits that only Honeywell can offer.

These 350 DataCenters now operating in all types and sizes of buildings clearly demonstrate Honeywell's leadership in centralized control. And this experience is available to you at no obligation. A Honeywell control specialist will be happy to work with you in designing a center to fit your client's needs. Just call your local Honeywell office.

**Trademark*

†*List of installations, including those in your area, available on request.*

Honeywell

First in Control

Corrosion Measuring Technique

An electronic measuring technique that promises to sharply reduce the cost of controlling internal corrosion in process equipment and pipe lines has been developed by Crest Instrument Co., Santa Fe Springs, Calif., a division of Magna Products Co.

Internal corrosion is generally controlled by the addition of inhibitor chemicals. These serve to protect the metal surfaces against attack. The exact amount of inhibitor to do the job has been difficult to determine, however. Usual method has been to measure the weight loss of small metal coupons after they have been exposed to the corrosive atmosphere for several days, weeks, or months. The amount of inhibitor is varied to find a safe corrosion level.

The new technique provides a daily, or even an hourly record of corrosion attack. Capable of detecting as little as a millionth of an inch of corrosion, the method gives process engineers a way of judging the effect on corrosion, almost immediately, of even small changes in process conditions or inhibitor concentrations. Within days they can determine the optimum conditions that give minimum corrosion.

More information? Circle Item 50, postcard, last page.

New Smoke Indicator

Ess Instrument Co., Bergenfield, N. J., announces a new smoke indicator combining its Wyd-Angle periscope and its Hazegage combustion indicator. An electric-eye pickup is located in the vision box of the periscope; no change is required in existing periscopes except to substitute the Wyd-Angle vision box which is equipped with the electric eye and connected to the Hazegage.

The periscope may be observed at any point within 90 degrees of axis and may be placed above eye height, if desired. The shadow screen gives a visual picture of all grades of smoke. The Hazegage gives meter measurement of smoke's quality; it may be mounted at a remote point, control room, or in firing aisle. On oil burners, considerable fuel savings can be had by following Hazegage indications of fuel-air ratio, according to the company.

More information? Circle Item 51, postcard, last page.

FOR MORE TO WORK WITH ... WORK WITH HONEYWELL

For your mechanical systems...Honeywell Hi Velocity Double-Duct Mixing Box Controls

Now your choice of two constant volume systems

1. Honeywell's Volumatic* system gives clients dependable, economical, constant volume control of double-duct systems. This control system uses piston motors with nylon bearings which require less lubrication and a sensitive pressure regulator. It can be applied to all sizes and types of mixing boxes.

2. Honeywell's Duablend* system gives your clients superior performance and minimum maintenance. Better performance is secured by using *two* pressure regulators to assure constant volume from *each* duct (under control of space thermostat) regardless of pressure changes. Its exclusive Sub-master pressure regulator provides a similar stabilizing control action to the Sub-master duct thermostat in heating and ventilating units.

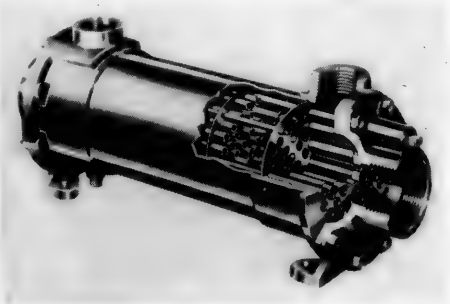
For minimum maintenance, the Duablend† system uses the simple Honeywell Air-Balance Valves*. These valves have no mechanical parts to wear and no adjustments. The valves operate on the balance of air pressure on two sides of a flexible diaphragm.

*Trademark
†Duablend formerly termed Air Blender

Honeywell
First in Control

Stainless Steel Exchangers

Series SSCG stainless steel heat exchangers are announced by Ross Heat Exchanger Division of American-Standard, Buffalo, N. Y. They are expected to be utilized primarily in the chemical and process industries. Mass



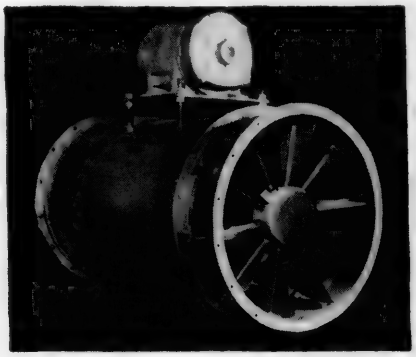
production methods are said to have lowered costs considerably, making the line attractive for pilot plant applications as well as production.

Nineteen sizes are available in one-, two-, and four-pass designs. Tubes have been roller-expanded into the tube sheet for tight fit. Transverse baffling, close tolerances between shell and baffles as well as between tubes and baffles, and interchangeability of parts, are featured. Units are tested at 450 psi and are said to perform as well either horizontally or vertically.

More information? Circle Item 52, postcard, last page.

Inlet Vanes Save Power

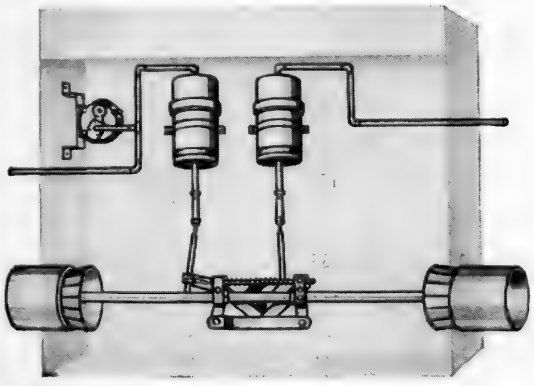
Variable inlet vane dampers for power saving at part-load operation of TC tubular centrifugal fans have been developed by the fans' manufacturer, Dryer Electric Corp., Brooklyn, N. Y. Volume of damper-equipped fans can be controlled manually or automatically at the exact



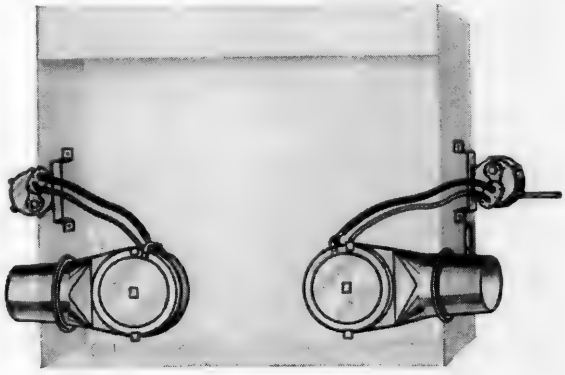
pressure desired. Non-binding vanes, turned by low-friction linkages in the centered control box, facilitate remote control of fan volume, the company states.

Dampers are available as an integral part of TC fans with capacities up to 150,000 cfm at static pressures up to 12 inches of water. The damper's vanes save power when volume is reduced by giving air entering the fan a spin in the direction of the impeller wheel's rotation.

More information? Circle Item 53, postcard, last page.



VOLUMATIC



DUABLEND

Here's how these two dependable systems work

Volumatic System: 1) Space thermostat operates motor to change ratio of hot and cold air. 2) Pressure regulator in mixed air operates another motor to adjust linkage, increase or decrease total volume from both hot and cold ducts (as shown above). Or, (not shown) 1) Space thermostat operates motor to control hot duct valve. 2) Pressure regulator in mixed air operates motor to control cold duct valve, maintain constant total volume. This low cost system gives dependable control, is easy to maintain, fits all sizes and types of mixing boxes.

Duablend System: 1) Space thermostat resets Sub-master pressure regulator controlling valve in hot duct. 2) Pressure regulator in mixed air controls the total air volume by operating cold duct valve. 3) Change in flow resulting from changes in hot duct pressure is corrected by Sub-master regulator operating hot valve without disturbing cold. 4) A change in flow caused by changes in cold duct pressure is corrected by regulator controlling total flow which adjusts cold duct valve. Sub-master flow regulator holds hot duct flow constant.

DEGREE-DAYS FOR OCTOBER, 1958

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

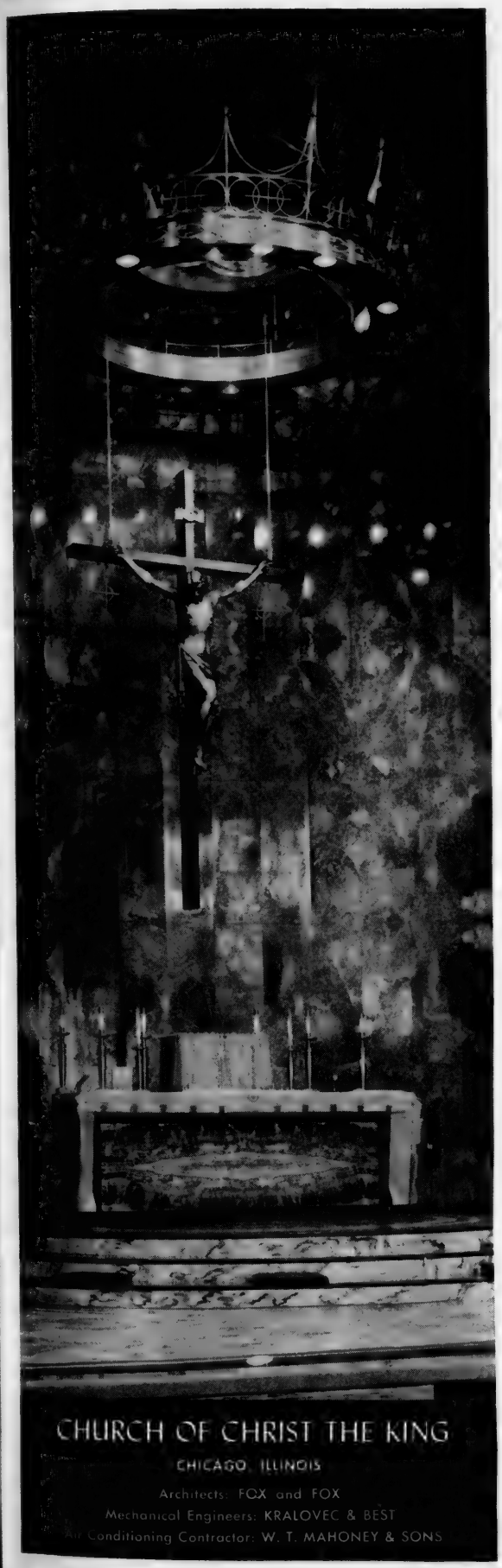
AIR CONDITIONING, HEATING AND VENTILATING's 31st Year of Publication of Monthly Degree-Day Data

City	October			Season to Oct. 31, incl., from Sept. 1		
	1958	1957	Normal	1958	1957	Normal
Abilene, Texas (A)	133	141	98	139	147	153
Albany, New York (A)	499	450	443	641	602	582
Albuquerque, New Mexico (A)	249	270	218	284	273	228
Alpena, Michigan (C)	462	565	530	663	810	745
Asheville, North Carolina (C)	292	398	262	333	458	312
Atlanta, Georgia (A)	115	207	110	115	243	118
Atlantic City, New Jersey (A)	301	258	230	363	298	259
Augusta, Georgia (A)	134	168	59	135	187	59
Baltimore, Maryland (C)	226	233	207	247	266	236
Billings, Montana (A)	404	623	497	566	811	691
Binghamton, New York (C)	460	489	428	615	620	569
Birmingham, Alabama (A)	107	217	123	107	241	136
Bismarck, North Dakota (A)	535	605	598	720	869	825
Block Island, Rhode Island (A)	369	316	330	455	383	418
Boise, Idaho (A)	299	470	389	442	535	524
Boston, Massachusetts (A)	386	317	315	(a)	374	392
Buffalo, New York (A)	395	456	433	520	596	555
Burlington, Iowa (A)	288	407	336	370	504	419
Burlington, Vermont (A)	543	503	858	734	672	693
Cairo, Illinois (C)	156	226	161	174	233	189
Charleston, South Carolina (C)	66	90	34	66	92	34
Charlotte, North Carolina (A)	178	229	147	180	266	154
Chattanooga, Tennessee (A)	174	269	169	182	288	193
Cheyenne, Wyoming (A)	467	553	557	670	837	818
Chicago, Illinois (A)	255	397	350	322	486	440
Cincinnati, Ohio (C)	214	292	222	236	322	264
Cleveland, Ohio (A)	316	402	340	402	499	415
Columbia, Missouri (A)	224	321	262	272	368	324
Columbia, South Carolina (A)	148	160	76	151	180	76
Columbus, Ohio (C)	307	385	299	361	444	358
Concord, New Hampshire (A)	544	482	527	726	649	719
Concordia, Kansas (C)	236	340	277	286	394	332
Dallas, Texas (A)	78	127	53	78	127	53
Dayton, Ohio (A)	323	410	324	392	487	397
Denver, Colorado (A)	342	420	425	448	561	545
Des Moines, Iowa (A)	304	499	355	381	562	454
Detroit, Michigan (A)	323	432	381	421	562	477
Devils Lake, North Dakota (C)	580	655	654	838	995	930
Dodge City, Kansas (A)	240	336	262	288	391	302
Dubuque, Iowa (A)	349	510	444	479	690	593
Duluth, Minnesota (C)	603	669	614	882	1026	891
Elkins, West Virginia (A)	432	554	412	577	663	534
El Paso, Texas (A)	120	127	70	136	127	70
Ely, Nevada (A)	533	659	561	760	911	789
Escanaba, Michigan (C)	471	561	555	701	853	802
Evansville, Indiana (A)	256	333	215	295	361	274
Fargo, North Dakota (A)	494	568	586	668	842	801
Fort Smith, Arkansas (A)	140	194	131	154	197	140
Fort Wayne, Indiana (A)	343	467	377	449	607	484
Fort Worth, Texas (A)	82	144	58	82	144	58
Fresno, California (A)	21	79	86	23	79	86
Galveston, Texas (C)	35	49	0	35	49	0
Grand Junction, Colorado (A)	278	340	333	340	395	369
Grand Rapids, Michigan (A)	374	511	462	525	707	606
Green Bay, Wisconsin (A)	437	586	515	631	849	698
Greensboro, North Carolina (A)	253	324	202	274	376	231
Greenville, South Carolina (A)	160	234	131	166	277	141
Harrisburg, Pennsylvania (A)	336	376	308	398	452	377
Hartford, Connecticut (A)	460	424	384	596	547	485
Havre, Montana (C)	512	753	564	738	957	834
Helena, Montana (A)	561	738	617	824	1002	937
Houston, Texas (C)	48	71	0	48	71	0
Huron, South Dakota (A)	426	501	472	543	691	621
Indianapolis, Indiana (A)	318	415	306	395	505	385
Jackson, Mississippi (A)	83	149	69	83	166	69
Kansas City, Missouri (A)	176	302	240	201	331	284
Knoxville, Tennessee (A)	169	262	179	174	285	212
La Crosse, Wisconsin (A)	350	509	447	467	687	599
Lander, Wyoming (A)	472	576	632	665	843	876
Lewiston, Maine (O)	594	509	501	779	696	666

(a) Data not available.

Normal figures in this table are based on 30-year period covering 1921 to 1950, inclusive, as compiled and published by the U. S. Weather Bureau.

Figures in this table, with two exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively. [Table concluded on page 116]



CHURCH OF CHRIST THE KING
CHICAGO, ILLINOIS
Architects: FOX and FOX
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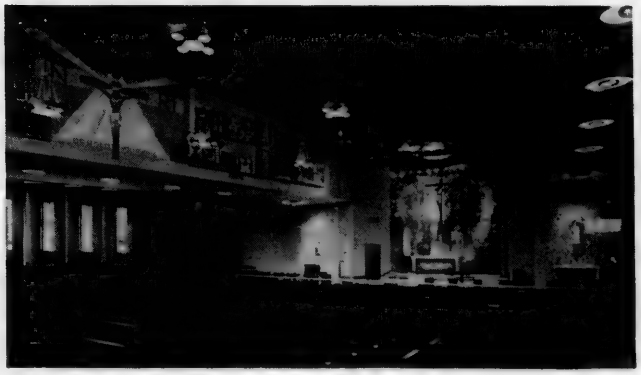
Why More and More

Air Conditioned Churches

Are Controlled by POWERS



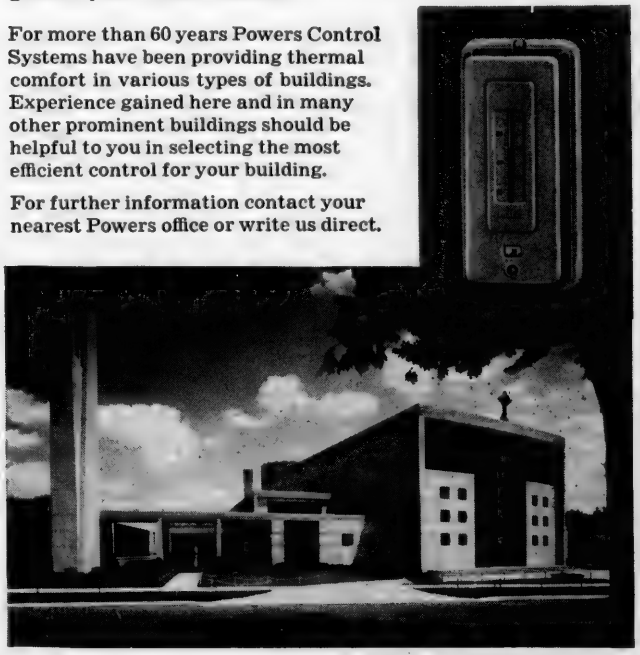
POWERS

Year 'round AIR CONDITIONING Control System

used in this distinguished modern church helps provide these important benefits: (a) light and airy appearing church due to use of large glass areas, without penalties of cold drafts or excessive solar heat; (b) people attending weddings, funerals and other services leave church without feeling and looking wilted in hot weather, no drooping altar candles; (c) closed windows reduce cleaning bills and outdoor noises; (d) increased attendance due to greater year 'round comfort.

For more than 60 years Powers Control Systems have been providing thermal comfort in various types of buildings. Experience gained here and in many other prominent buildings should be helpful to you in selecting the most efficient control for your building.

For further information contact your nearest Powers office or write us direct.



THE POWERS REGULATOR CO.

SKOKIE, ILLINOIS | *Offices in Chief Cities in U.S.A., Canada and Mexico*

Over 60 Years of Temperature and Humidity Control

(c51)

Degree-Days for October, 1958 (Concluded)

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING's 31st Year of Publication of Monthly Degree-Day Data

City	October			Season to Oct. 31, incl., from Sept. 1		
	1958	1957	Normal	1958	1957	Normal
Lincoln, Nebraska (C)	249	386	310	295	462	389
Little Rock, Arkansas (A)	115	164	110	125	164	120
Los Angeles, California (C)	2	16	41	2	16	58
Louisville, Kentucky (A)	229	316	232	252	338	283
Lynchburg, Virginia (A)	264	365	236	298	430	285
Macon, Georgia (A)	78	150	63	78	150	63
Madison, Wisconsin (A)	371	535	419	508	732	556
Marquette, Michigan (C)	477	516	543	685	775	779
Memphis, Tennessee (A)	138	191	126	150	197	143
Meridian, Mississippi (A)	82	149	90	82	171	90
Milwaukee, Wisconsin (A)	348	503	428	481	696	562
Minneapolis, Minnesota (A)	370	500	459	478	684	616
Moline, Illinois (A)	289	467	363	382	603	459
Montgomery, Alabama (A)	59	133	69	59	150	69
Nashville, Tennessee (A)	187	270	154	203	280	176
New Haven, Connecticut (A)	396	377	363	494	464	456
New Orleans, Louisiana (C)	29	63	5	29	69	5
New York, New York (C)	296	268	263	335	315	302
Newark, New Jersey	323	289	301	360	343	348
Norfolk, Virginia (A)	132	214	152	139	223	161
North Platte, Nebraska (A)	416	482	425	526	665	545
Oak Ridge, Tennessee (C)	194	254	225	216	266	225
Oakland, California (A)	81	97	157	97	105	233
Oklahoma City, Oklahoma (A)	158	263	149	175	280	161
Omaha, Nebraska (A)	272	404	331	324	495	419
Parkersburg, West Virginia (C)	305	389	272	360	438	328
Peoria, Illinois (A)	274	408	339	346	478	425
Philadelphia, Pennsylvania (C)	278	256	219	311	296	252
Phoenix, Arizona (A)	4	12	13	4	12	13
Pittsburgh, Pennsylvania (C)	312	394	298	376	458	354
Pittsfield, Massachusetts (A)	570	548	543	792	753	756
Pocatello, Idaho (A)	421	538	487	595	704	670
Portland, Maine (A)	586	468	515	796	652	714
Portland, Oregon (C)	187	295	280	258	305	365
Providence, Rhode Island (A)	415	368	381	523	461	488
Pueblo, Colorado (A)	312	324	383	373	405	457
Raleigh, North Carolina (A)	217	295	118	240	333	128
Rapid City, South Dakota (A)	412	553	500	539	742	693
Reading, Pennsylvania (C)	313	338	285	370	402	342
Red Bluff, California (A)	26	149	59	29	159	59
Reno, Nevada (A)	377	556	443	532	672	608
Richmond, Virginia (A)	212	317	210	236	367	243
Rochester, New York (A)	428	477	440	568	635	573
Roswell, New Mexico (A)	217	223	156	255	233	164
Sacramento, California (C)	19	103	75	22	105	92
St. Joseph, Missouri (A)	244	365	233	288	419	282
St. Louis, Missouri (C)	170	281	202	198	298	240
Salt Lake City, Utah (A)	300	401	381	416	502	469
San Antonio, Texas (A)	75	71	25	75	71	25
San Diego, California (A)	1	8	52	1	8	76
Sandusky, Ohio (C)	299	409	327	366	504	393
San Francisco, California (C)	112	81	128	151	137	238
Sault Ste. Marie, Michigan (A)	575	590	639	848	908	937
Savannah, Georgia (A)	84	107	38	84	107	38
Scranton, Pennsylvania (A)	463	479	389	620	618	504
Seattle, Washington (C)	265	337	329	370	367	463
Sheridan, Wyoming (A)	491	637	578	701	885	817
Shreveport, Louisiana (A)	85	115	53	85	115	53
Sioux City, Iowa (A)	315	460	405	389	593	533
Spokane, Washington (A)	452	612	508	678	718	713
Springfield, Illinois (A)	276	392	259	335	464	315
Springfield, Missouri (A)	247	310	249	296	351	310
Syracuse, New York (A)	451	457	396	584	588	513
Toledo, Ohio (A)	367	471	387	484	616	489
Topeka, Kansas (C)	244	318	242	293	354	284
Trenton, New Jersey (C)	329	311	285	383	371	340
Tulsa, Oklahoma (A)	146	225	152	164	230	170
Utica, New York (O)	466	349	430	623	564	612
Valentine, Nebraska (A)	449	511	461	579	697	606
Walla Walla, Washington (C)	303	446	308	385	488	401
Washington, D. C. (C)	208	305	231	231	348	263
Wichita, Kansas (A)	205	323	219	240	358	251
Williston, North Dakota (C)	517	668	605	744	903	866
Winnemucca, Nevada (A)	462	604	508	660	757	688
Yakima, Washington (A)	452	522	446	644	604	596

For footnotes, see page 114.

McQuay Horizontal Seasonmaster with water coil, steam coil, face and by-pass, and flat filter section. Removable panels permit complete accessibility for inspection or service. Horizontal models available in 17 sizes, ranging from 640 to 38,100 cfm.

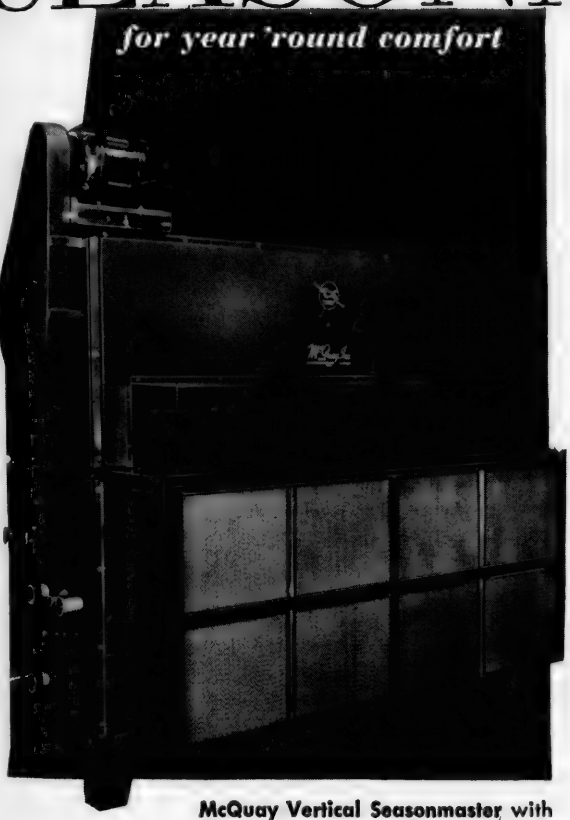
McQuay SEASONMASTERS

for year 'round comfort

The most universal line of air conditioners in the industry

The McQuay line of Seasonmaster central station air conditioners is truly universal. It is the most versatile, the most flexible and the most complete in the industry. McQuay Seasonmaster units will both heat and cool, filter, humidify and dehumidify, when furnished with steam, water heating, water cooling or direct expansion coils in capacities from 640 to 38,100 cfm. A full line of accessories is available for any heating or cooling combination.

For small or large area air conditioning, look to McQuay. Compare the versatility, compare the quality and performance and compare the range of models. And always remember, only McQuay gives you Ripple-Fin coils, Dura-Frame construction and Galva-Seal bonderized, baked-on enamel finish. See the McQuay representative in or near your city or write McQuay, Inc., 1619 Broadway Street N. E., Minneapolis 13, Minnesota.

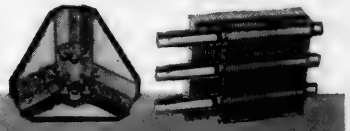


McQuay Vertical Seasonmaster with direct expansion coil, steam coil, face and by-pass, and flat filter section. Heavy gauge galvanized channel framework to form a rigid structure. Sixteen sizes are available, ranging from 640 to 29,000 cfm.

McQuay INC.

AIR CONDITIONING • HEATING • REFRIGERATION

Means Quality



McQuay units feature the exclusive Ripple Fin Coils which create maximum air turbulence and have wide, full fin collars that act as automatic spacers to form a tube around the coil tube for positive, permanent bond, greatest heat transfer and protection. The Dura-Frame "V" channel construction provides the strength and rigidity necessary for quiet, trouble-free operation.

NEWS OF THE MONTH

HOT-COLD-LIGHT PANEL

Experimental panel combines into a single operating unit, with no moving parts, thermoelectric refrigeration and electroluminescent lighting. Thermoelectric refrigeration produces cooling in certain solids directly from flow of electric current. Electroluminescent lighting is produced by glowing treated panels about the thickness of window glass. The foot-square "hot-cold-light" panel, revealed by Dr. J. A. Hutcheson, vice-president in charge of engineering and research, Westinghouse Electric Corp., Pittsburg, Pa., is composed of solid state materials, produces light equivalent of 25-watt bulb, maintains surface temperature of interior of household refrigerator, and, by flick of a switch, raises that surface temperature to about 130 deg F, suitable for panel heating.

NEW GAS CONDITIONER

unveiled at AGA convention. Units to 25 tons planned. Say system is free from code curbs.

An engineering model of a new gas air conditioning unit was shown at the annual convention of the American Gas Association in Atlantic City, N. J. A limited number of test models will be produced by the late spring of 1959 with 3 tons of cooling capacity and 96,000 Btu per hr heating output. Units to 25-ton capacity are being developed.

In its development stage the unit has become known as the "remote" because it is designed to be installed outside the home, and "add-on" because it will provide gas-fired cooling in homes already equipped with central heating systems. It will be added to the Sun Valley line of Arkla Air Conditioning Corp., Evansville, Ind., a wholly-owned subsidiary of Arkansas Louisiana Gas Company, who last year bought the All-Year Air Conditioning Division of Servel, Inc.

According to the manufacturer, the new unit will be under no restrictions because of local codes; It uses tap water as a refrigerant, a common salt solution as its absorbent, and operates at sub-atmospheric pressure at all times. Like its Sun Valley predecessors, unit is essentially a water-cooled absorption machine, but its cycle reverses for winter heating. An evaporative cooler is built in.

AIR CONDITIONED BOARDWALK

provides unusual application for evaporative condensers near Phoenix, Ariz. (Photo on front cover.)

A boardwalk, 558 feet long, covered with a roof and open on one side, has been installed at the Deer Valley Estates, on the outskirts of Phoenix, Ariz., to permit visitors to see this development in comfort, regardless of oudoor temperatures.

On the roof at intervals of about 25 ft are installed 23 evaporative coolers made by International Metal Products Company. According to Robert Oliver, assistant sales manager of this company, this is the largest installation of evaporative coolers ever to cool an outdoor area.

On the enclosed side of this walk were placed product displays of suppliers for homes in this development.

Even though this development had its official opening at a time when the outside temperature was 106 deg, the thousands of persons who strolled on the boardwalk enjoyed cool comfort.

CHANCE TO LIVE

for premature babies enhanced by radiant heat system installed in incubators at Babies Hospital.

A radiant heating system developed at Babies Hospital, Columbia-Presbyterian Medical Center, New York City, will give premature babies a greater chance to grow normally. One fourth of all premature babies face life with some degree of brain impairment, a percentage largely garnered from the smallest infants; and one out of every 15 births in the United States is premature, reports *The Stethoscope*, publication of the Presbyterian Hospital.

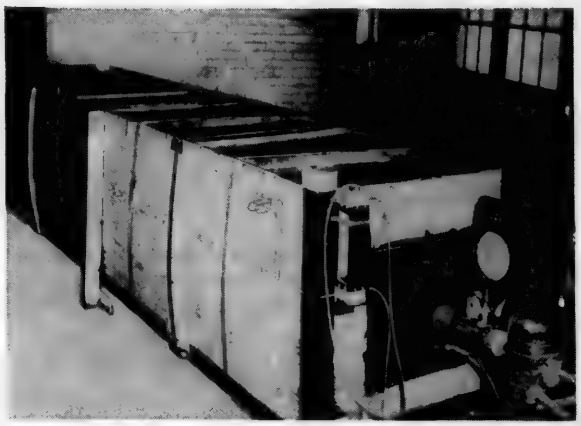
• **INCUBATOR TEMPERATURE CRITICAL—** The most urgent problem of the premature infant is to keep warm enough to stay alive. His blood circulation is sluggish, his breathing feeble, and he lacks insulating fat. According to Dr. William A. Silverman, director of the

(News of the Month continued on page 120)

for users of underground piping systems...

Now... for the first time, basic principles used by RIC-WIL for decades are supported by extensive independent research. These principles are brought out in Technical Reprint #16, issued as a compilation of the results of a survey by the Building Research Advisory Board, of the National Academy of Sciences and tests made by the National Bureau of Standards. These criteria are also the basis of new Guide Specifications issued by several Federal Agencies, all of which include the basic principles of RIC-WIL Prefabricated Insulated Piping Systems. This survey is of such magnitude that it required over 2,000 man-hours and some 2,500 pages of documents and tests.

All tests of a conduit system required by the survey and specifications have been completed by RIC-WIL and an approved independent testing laboratory has certified that RIC-WIL Systems comply. Write, wire or phone for complete information.



Part of test equipment built by RIC-WIL in QUALIFICATION TEST PROGRAM.

Ask for RIC-WIL *Catalog on complete line of systems available.*

Quality Piping Systems...
... of Exceptionally High Thermal Efficiency

SINCE 1910

RIC-WIL INCORPORATED — PREFABRICATED INSULATED PIPING SYSTEMS

BARBERTON, OHIO

IN CANADA: THE RIC-WIL COMPANY OF CANADA LIMITED

See our catalog in Sweet's and Engineers' Product File

premature nursery at the hospital, the infants do not have the resources for temperature regulation.

"Although we have a marvelous system for controlling the temperature and humidity of the air circulating through the entire premature unit as well as that supplied to each incubator," Dr. Silverman states, "we have not until recently been able to provide minute-to-minute individual control of the temperature of the incubator to respond to the changing heat requirements of each infant. Now we think we have the thing licked."

• **THERMOSTAT ON ABDOMEN**—Incubator air is supplied at a controlled base temperature of 86 deg F, but this heat is supplemented by infra-red lamps. In this way, the baby absorbs heat directly from the lamps, rather than the air. His temperature is mainatined at an almost constant 98.6 deg F.

Each infant wears a temperature-sensing element attached to his abdomen. Through feed-back controls, automatic shut-off of the infra-red lamps is achieved the instant the baby's temperature goes above a set level. Thus the device also provides automatic adjustment to varying levels of air humidity (which affect the body's ability to lose or gain heat).

In each incubator an "artificial baby", an assembly of glass tubing enclosing a heat-sensitive element, safeguards against flaws in the operation of the automatic temperature control. If the temperature of the artificial baby goes above the safety point, a red light and an alarm buzzer alert those in attendance.

Doctors have disagreed upon what are the optimum humidity and temperature conditions for premature infants. On the basis of carefully controlled observations involving some 500 infants, doctors of Babies Hospital have reached these tentative conclusions:

Premature infants do better at higher than at lower temperatures. Moist air does not make it easier for premature infants to breathe. The beneficial effect of humidity has been traced to the well-known fact that moist air reduces loss of body heat.

Dr. Frederic J. Agate of the hospital's Department of Anatomy has contributed a major portion of the work that went into development of the radiant heaing system, says Dr. Silverman. The new units provide a microclimate unlike any ever experienced by newborns before, and considerably closer to the ideal climate supplied by the mother's body.

CERTIFICATION PROGRAM

for unitary air conditioners launched. Effective on January 1. Major manufacturers sign contract pledge.

Completion of the first phase of the certification program for unitary air-conditioners, initiated last May as a cooperative project of Air-Conditioning and Refrigeration Institute, Washington D.C., and National Warm Air Heating and Air-Conditioning Association, Cleveland, Ohio, was announced by Geo. S. Jones, Jr., managing director of ARI, and George Boeddener, managing director of National Warm Air. This initial phase included signing of contract agreements by the majority of manufacturers in this field.

Seal attests manufacturer's compliance with code.

The program, which becomes effective January 1, 1959, will cover thousands of residential and commercial type air-conditioners, it was pointed out, and certification of this equipment by its manufacturers will include a program of testing by an independent laboratory under con-

(News of the Month continued on page 140)

STATEMENT REQUIRED BY THE ACT OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (Title 39, United States Code, Section 233) SHOWING THE OWNERSHIP, MANAGEMENT, AND CIRCULATION OF "AIR CONDITIONING, HEATING AND VENTILATING" published monthly at East Stroudsburg, Pennsylvania for October 1, 1958.

1. The names and addresses of the publisher, editor, managing editor, and business managers are:
Publisher, The Industrial Press, 93 Worth Street, New York 13, N. Y.
Editor, Clifford Strock, 93 Worth Street, New York 13, N. Y.
Managing editor, None.

Business managers: Robert B. Luchars, 93 Worth St., New York 13, N. Y.; Edgar A. Becker, 93 Worth St., New York 13, N. Y.; Harold L. Gray, 93 Worth St., New York 13, N. Y.

2. The owner is:
The Industrial Press, 93 Worth St., New York 13, N. Y.; Robert B. Luchars, 93 Worth St., New York 13, N. Y.; Edgar A. Becker, 93 Worth St., New York 13, N. Y.; Franklin D. Jones, 93 Worth St., New York 13, N. Y.; Walter E. Robinson, 93 Worth St., New York 13, N. Y.; Charles O. Herb, 93 Worth St., New York 13, N. Y.; Harold L. Gray, 93 Worth St., New York 13, N. Y.; Clifford Strock, 93 Worth St., New York 13, N. Y.; Suno E. Larson, 93 Worth St., New York 13, N. Y.; Helena E. Oberg, 65 - 82nd St., Brooklyn 9, N. Y.; Edgar L. Becker, Nominee for Nancy Jane Becker, Susan Louise Becker and Donald Louis Becker, 714 Wellington Rd., Ridgewood, N. J.; Montclair National Bank & Trust Company and R. B. Luchars, Trustees (Beneficiaries Unknown), Upper Montclair, N. J.; Montclair National Bank & Trust Company and Kenneth D. Ketchum, Trustees (Beneficiaries Unknown), Upper Montclair, N. J.; David D. Ketchum, 38 Mill Road, Falmouth, Mass.; Lee W. Noyes, Guardian for Susan Yarnall Urban, Greensboro, Vt.; Lee W. Noyes, Trustee U/W of Robert L. Urban, Greensboro, Vt.; John T. Urban, 8 Craigie Circle, Cambridge 38, Mass.

3. The known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are:
Dorothy B. Baldwin, 420 Clinton Ave., Brooklyn 38, N. Y.; Franklin D. Jones, 14 Washington Place East, New York 3, N. Y.; Helen L. Ketchum, 231 King St., Cohasset, Mass.; Robert B. Luchars, 93 Worth St., New York 13, N. Y.; Wilbert A. Mitchell, 28 Harlow Road, Springfield, Vt.; Henry V. Oberg, 6825 Almansa St., Coral Gables, Fla.; Ann Pelletier, 116 Pinehurst Ave., New York 33, N. Y.; Elizabeth Y. Urban, 38 Lakeview Road, Asheville, N. C.

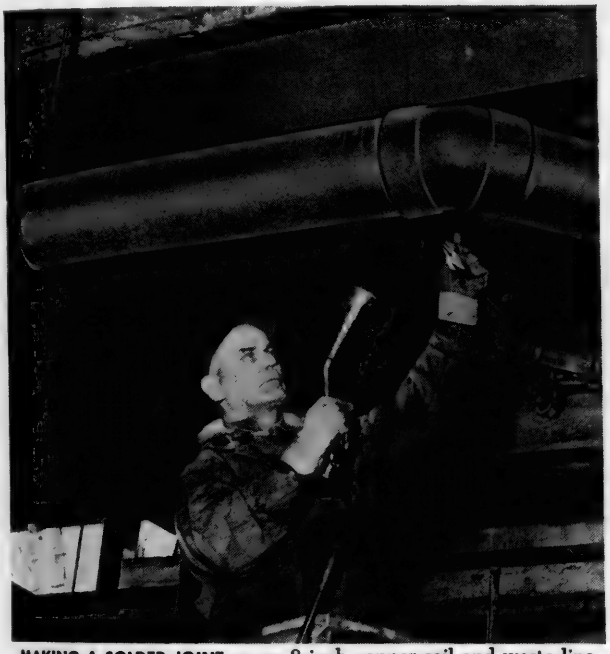
4. Paragraphs 2 and 3 include, in cases where the stockholders or security holder appears upon the books of the company as trustees or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

EDGAR A. BECKER, Business Manager
Sworn to and subscribed before me this 11th day of September, 1958.
ALEXANDER LOYKA
Notary Public, State of New York, No. 31-7611350. Qualified in New York County. Commission expires March 30, 1960.

COPPER

simplifies plumbing in big addition to Children's Hospital, Pittsburgh

ARCHITECT'S RENDERING of Children's Hospital Addition (foreground) at Pittsburgh. *Architect*: Alfred D. Reid Associates, Pittsburgh. *Consulting Engineer*: J. A. Murray, Pittsburgh. *Plumbing Contractor*: Sauer, Inc., Pittsburgh.



MAKING A SOLDER JOINT on an 8-inch copper soil and waste line – the largest size used in the drainage system. Solder-joint connections are one of the important reasons why copper tube systems are so much easier and faster to install.

TESTING A VALVE on the hot-water supply system. Other copper tube lines in view are part of the sanitary drainage system, ranging in size from 1½ inches to 4 inches. Because connections are easily made, even in tight quarters, the lines can hug the ceiling.

SOME 70,000 pounds of Anaconda copper tube were used in the sanitary drainage system, hot- and cold-water lines, oxygen, vacuum, and compressed-air lines of the addition to Children's Hospital in Pittsburgh.

Copper plumbing provides the advantages of easier, faster installation, with additional economies in design and construction made possible by the lighter weight of copper tubes and the trim, space-saving, solder-joint fittings. Equally important, however, are the long-range benefits. Copper tube systems last longer, require less maintenance than systems of other materials.

Everyone benefits with all-copper plumbing. Architects have greater freedom in design to locate bathrooms and utilities where desired without sacrificing useful space. Contractors report that installation time has been reduced up to one-half – and their men prefer working with copper tube. Owners get plumbing that lasts – costs little to maintain.

Anaconda Copper Tubes are available in all standard wall thicknesses – Types K, L, M, and DWV (Copper Drainage Tube) – through plumbing wholesalers. There's a full line of Anaconda wrought and cast solder-joint fittings. For more information on ALL-COPPER plumbing, write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

MADE IN U.S.A. TO THE STANDARDS OF AMERICAN INDUSTRY

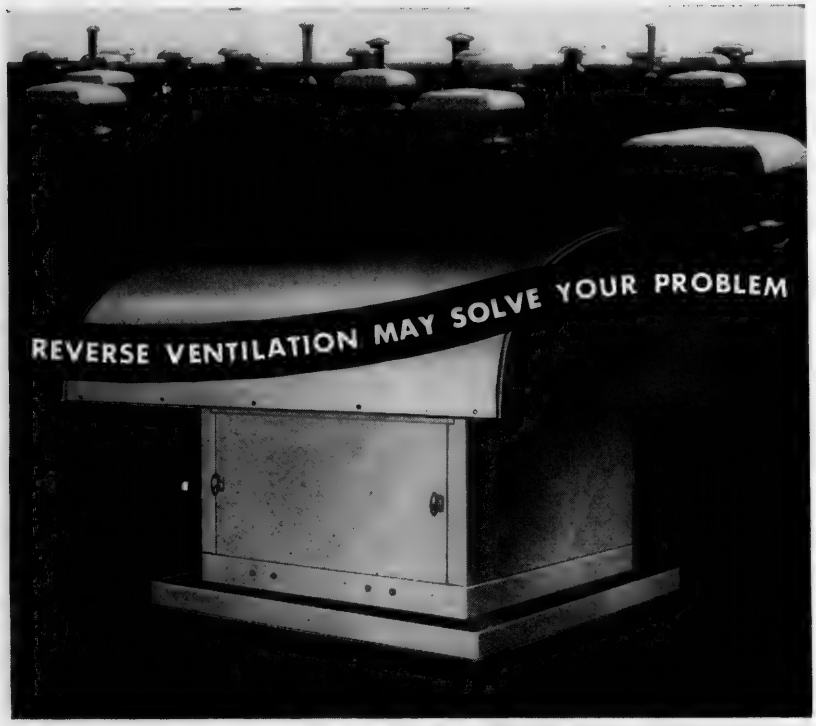
5800

ANACONDA®

COPPER TUBES AND FITTINGS

Products of **THE AMERICAN BRASS COMPANY**

Available through Plumbing Wholesalers



Burt Low Type Ventilators, Supply and Exhaust Air for Aluminum Co. of America

Blow Down Fresh Air to Blanket Floor Area

Wide, low-roofed, modern single-story plants are often difficult to ventilate properly with conventional methods. Perimeters are comfortable but other areas may not be.

Aluminum Company of America's new Screw Machine Products Plant at Lancaster, Pa., with neither cross ventilation nor natural ventilation, solved this problem with "reverse" ventilation. Forty-nine 48" all-aluminum Burt Low Type Roof Ventilators maintain a year-round pleasant working atmosphere.

Twenty-five of the Burt Ventilators operate in *reverse* to blow a blanket of fresh air over the entire working floor. Adjustable diffusers circulate the air at floor level to meet seasonal needs. Strategically located over various hot areas, these Burt supply ventilators need no long horizontal duct runs to reach air intakes on outside walls.

The other twenty-four Burt ventilators exhaust the considerable heat and oil mist from production operations. *The cost of these Burt units was less than one-fourth that of a centralized duct system.*

For fresh air at low cost in your plants, why not investigate Burt's complete line of modern, efficient roof ventilators now!

Send for **FREE** *Data Book!*

Write for Burt Data Book SPV-101-G.
It supplies quick data on Burt's complete line of modern Roof Ventilators.

FAN & GRAVITY VENTILATORS • LOUVERS • SHEET METAL SPECIALTIES

The Burt Manufacturing Company

49 E. South St. Akron 11, Ohio

MEMBER AIR MOVING & CONDITIONING ASSOCIATION, INC.

NEW CATALOGS

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

AIR-COOLED PACKAGE CHILLERS — Bulletin 8027A, from Dunham-Bush, Inc., West Hartford, Conn., describes the company's ARPC air-cooled package chillers and RCU remote condensing unit assemblies for residential as well as commercial and industrial chilled water applications. Included in bulletin are capacity and dimensional data, plus specifications and wiring schematics.

Circle **Item 55** on Inquiry Card

ELECTRIC RADIANT HEATERS—Edwin L. Wiegand Co., Pittsburgh, Pa., offers Bulletin F-1614 describing the company's line of Chromalox electric radiant comfort heaters. It covers both the new ceiling type radiant heater and a previously announced angular-mounted model. A simple guide for selecting heaters and controls is also included.

Circle **Item 56** on Inquiry Card

INDUSTRIAL DUST CONTROL—To assist engineers concerned with industrial dust control problems by giving illustrations of how others have solved them, The Flexaust Co., New York, N. Y., offers Bulletin 82. To further increase its usefulness, bulletin also includes selection, pricing, and accessory information.

Circle **Item 57** on Inquiry Card

METALLURGICAL SERVICE—A 16-page booklet, ADV-1009, published by Republic Steel Corp., Cleveland, Ohio, explains a new customer service being offered by the company. The three-part program consists of field, laboratory, and mill metallurgical service, and eight case histories show how it works.

Circle **Item 58** on Inquiry Card

DRAWN-CASE CAPACITORS—General Electric Co., Schenectady, N. Y., offers 4-page Bulletin GEA-6789 which describes features of the company's newly-designed a-c drawn-case capacitors used in air conditioning equipment and a variety of other industrial applications. It includes equipment photos, dimensional diagrams, and rating and dimension tables.

Circle **Item 59** on Inquiry Card

(Continued on page 124)

SelecTemp heating will please everyone in any building

This revolutionary system gives the occupants of residential, institutional and commercial buildings unequalled comfort. Every room is a separate heating zone

Architects, engineers and building owners are surprised when they discover the simplicity and efficiency of SelecTemp heating.

Automatic temperature control of each room is usually considered both complicated and expensive. Yet SelecTemp units, without electricity or wiring, make each room a separate heating zone. In addition, both the temperature and volume of circulating, filtered warm air is continuously modulated.

Low costs

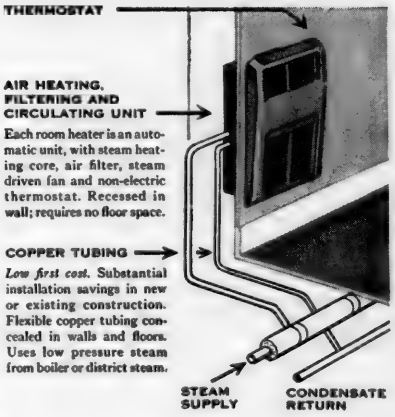
With all its advantages, SelecTemp costs no more than many conventional systems that do not have room-by-room temperature regulation.

Installation is fast and economical in either new or existing construction. Fuel costs are exceptionally low, as demonstrated in hundreds of installations throughout the United States and Canada.

Balanced heat

SelecTemp heating maintains the selected temperature in each room, even when weather conditions cause wide variations in heat loss from rooms on the warm and cold sides of a building. No room or area is overheated or underheated.

A complete description of the SelecTemp heating system, with specifications, will be mailed on request. Please use coupon below.


THERMOSTAT
AIR HEATING, FILTERING AND CIRCULATING UNIT
Each room heater is an automatic unit, with steam heating core, air filter, steam driven fan and non-electric thermostat. Recessed in wall; requires no floor space.
COPPER TUBING
Low first cost. Substantial installation savings in new or existing construction. Flexible copper tubing concealed in walls and floors. Uses low pressure steam from boiler or district steam.
STEAM SUPPLY
CONDENSATE RETURN

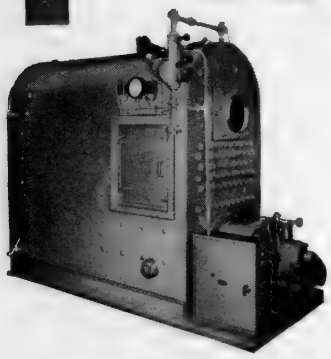
IRON FIREMAN®
Engineered
HEATING AND COOLING

IRON FIREMAN MANUFACTURING CO.
3076 West 106th Street, Cleveland 11, Ohio
(In Canada write to 80 Ward Street, Toronto)

- ☐ Send SelecTemp specifications and full information.
- ☐ Arrange for brief demonstration of SelecTemp room heating unit, in actual operation, in our office.

Name.....
Address.....
City.....
Zone..... State.....

SAVE 3 WAYS with International COMPAK®



Water Tube PACKAGE BOILERS

1. LOWER INITIAL COST

. . . in fact, these International, forced draft package boilers cost less than many modified scotch fire tube package units—yet offer so much more in terms of performance and operating economy.

2. LOWER OPERATING COST

All International COMPAK units are guaranteed to operate at 81% efficiency—with resultant fuel economy. Rapid water circulation through inclined water tubes assures fast generation of steam or hot water—in fact, much faster than modified scotch fire tube boilers.

3. LOWER MAINTENANCE COST

The natural sweeping action of hot gases over staggered rows of water tubes makes COMPAK boilers virtually self-cleaning. When required, full access is provided to *both* the fireside and waterside of all tubes without dismantling the boiler. Maintenance time and costs are kept to an absolute minimum.

The* International COMPAK *also gives you these features:

- Complete Package
- Fully Automatic Controls
- Oil and/or Gas Fired
- Quiet, Smooth Operation
- No Unsightly Stack
- Long Life Expectancy
- Low or High Pressure Design
- Fast Delivery

Get the facts from your

INTERNATIONAL DISTRICT REPRESENTATIVE

or write for Bulletin 1200 today.

IBW BOILER BUILDERS SINCE 1856

THE INTERNATIONAL BOILER WORKS CO.

Steel Firebox Heating & Power Boilers • Low & High Pressure Water Tube Package Boilers • International-LaMont Forced Recirculation Generators • ASME Code Pressure Vessels & Welded Products.

890 Spruce St. East Stroudsburg, Pa.

NEW CATALOGS

(Continued from page 122)

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

COPPER TUBE PLUMBING—A booklet, entitled Save on the Homes You Build, is designed to assist plumbing contractors in their selling efforts with builders, architects, and building contractors. The 24-page publication, available from Chase Brass & Copper Co., Waterbury, Conn., contains information describing how building costs can be cut through the use of copper tube for plumbing, heating, and air conditioning systems. Suggested specifications for water supply, underground service, heating, air conditioning, oil burner, and drainage installations with copper tube are included in the booklet.

Circle **Item 60** on Inquiry Card

AIR CONDITIONING MUSEUM — An interesting illustrated booklet on the Recold Museum of Air Conditioning and Refrigeration is available from Recold Corp., Los Angeles, Calif. Booklet describes many unique antiques utilized during the brief span of the mechanical air conditioning and refrigeration industry.

Circle **Item 61** on Inquiry Card

PIPELINE STRAINERS—Bulletin 1210B, published by Sarco Co., Inc., New York, N. Y., describes a new line of self-cleaning semi-steel pipeline strainers in sizes from ¼ through 3 inches. Tables list dimensions, weights, and prices.

Circle **Item 62** on Inquiry Card

AIR DIFFUSERS, MIXERS — Connor Engineering Corp., Danbury, Conn., announces Bulletin 30F which presents complete information on the company's Kno-Draft air diffusers, Series 45 high velocity valve attenuators, and Dorex air recovery equipment.

Circle **Item 63** on Inquiry Card

REDUCED VOLTAGE STARTERS — Design and construction features of automatic reduced voltage starters are described in Bulletin 14B8192 published by Allis-Chalmers, Milwaukee, Wis. Covering the range of starters from 50 to 1200 hp, 600 volts, the bulletin includes information, theory, and operation of low voltage starters.

Circle **Item 64** on Inquiry Card

(Continued on page 126)

HEATING PROBLEMS?

Get help in a hurry from Chromalox

Four pages of answers to all types of industrial and comfort heating problems. Application information, design features, complete data on sizes, ratings, temperatures to 1200°F. Controls and accessories. Also address listings of Chromalox Sales Engineering Representatives.

Call your Chromalox Man for the answers

For on-the-spot help, pick up the phone and call your Chromalox Representative. He has more than 15,000 standard types, sizes and ratings from which to select the best heater for your job.

For new or existing installations, Chromalox has: the world's most complete line of electric heating . . . the world's largest stock, for immediate shipment . . . personal "no obligation" assistance . . . factory design-engineering service for special applications. Chromalox answers are fast, clean, safe, accurate and economical. Call your Chromalox Man or write today.

2658

CHROMALOX
Electric Heat
INDUSTRIAL • COMMERCIAL • RESIDENTIAL
EDWIN L. WIEGAND COMPANY
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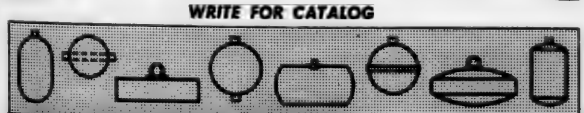
HARRIS
INDUSTRIAL
FLOATS

COPPER
STAINLESS STEEL
MONEL
STEEL
BRASS
ALUMINUM

Built for open or closed tank operation at low or high pressures and temperatures.

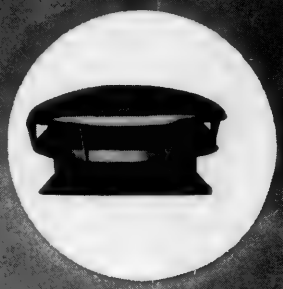
WRITE FOR CATALOG



ARTHUR HARRIS & CO.
Established 1874
206 N. Aberdeen St.
Chicago, Ill.

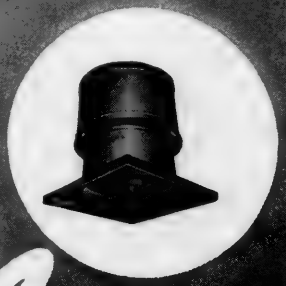
ACCEPTED
Allen
ROOF VENTILATION

Whatever your ventilating needs, be sure to see how Allen equipment can meet your requirements efficiently and economically.



NEW "I-LINE" for EYE APPEAL

The new "I-Line" provides an attractive low contour, assuring maximum capacity or efficiency with the minimum over-all height.



POWERFUL "VD" for HIGH VELOCITY

By moving a large volume of air at high velocity, this Vertical Discharge fan keeps fumes from sifting back into building.

Allen

. . . is prepared to investigate ventilating problems and plan systems for the efficient removal of heat, fumes, vapor or dust.

WIND-DRIVEN TURBINES

Three types of Allen turbines take full advantage of the economy of natural air movement.

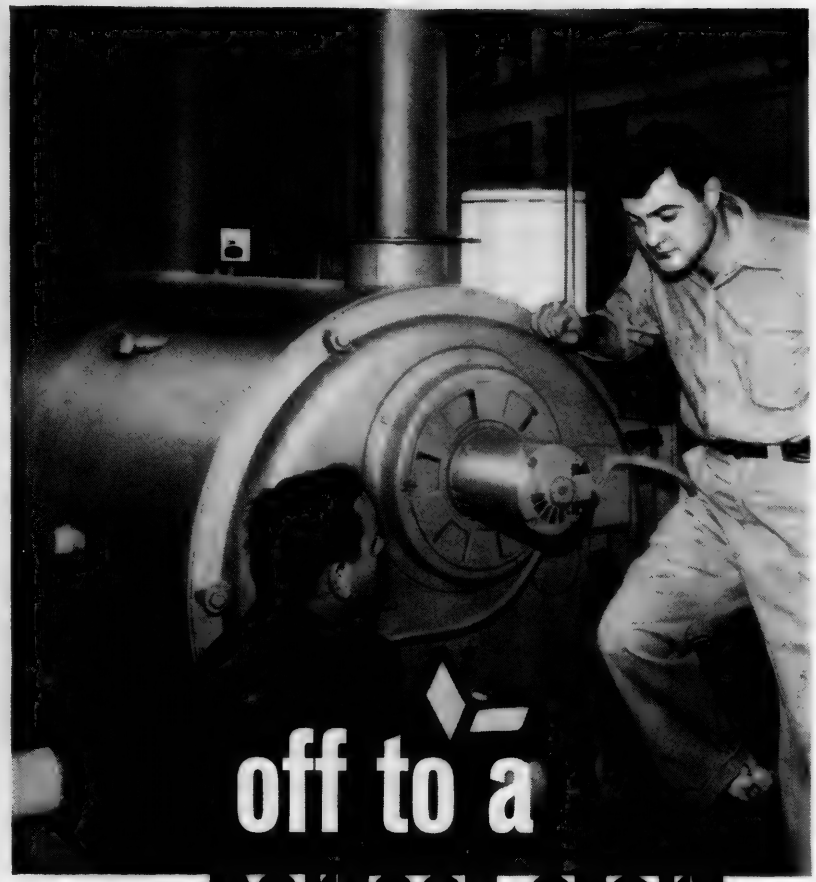
EXHAUST FANS

Remote drive Straventer is designed to handle corrosive fumes, and/or high temperature air.

THE ALLEN LINE

Write today for catalog that gives specifications and performance data on these and other units in the Allen ventilator line.

ALLEN
ALLEN COOLER & VENTILATOR, INC.
ROCHESTER, MICH.
Roof Ventilators for Every Commercial and Industrial Need
REPRESENTATIVES IN PRINCIPAL [illegible]



off to a perfect start

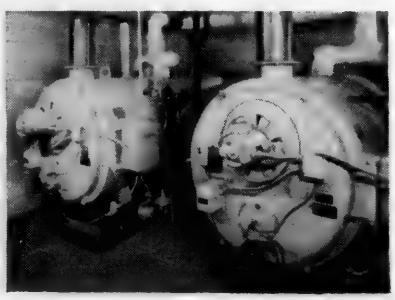
Cleaver-Brooks starting service sends Progress packaged boilers off to a right start . . . assures tip-top boiler performance . . . greater customer satisfaction.

This unique starting service is typical of many extra values you enjoy when you install America's finest commercial heating boiler . . . more evidence of Cleaver-Brooks undivided responsibility for boiler performance.

1. Every Progress boiler is started by a trained Cleaver-Brooks serviceman. He adjusts it carefully for fuels and loads on job site. This means fewer hours on the job for you . . . less cost . . . fewer call backs. It means superior performance, more satisfied customers.
2. Cleaver-Brooks serviceman trains the boiler attendant . . . instructs him in the care and operation of the boiler. This relieves you of the time and cost of this important follow-up responsibility.

Other important profit-making advantages in the Progress packaged heating boiler: packaged design, fully factory-tested, ready to install on the job site. Clean, quiet operation. High efficiency: 80% guaranteed. Hinged doors simplify maintenance.
Built by America's largest builder of packaged boilers.

Cleaver-Brooks Progress Boilers — seven sizes to 2,010,000 Btu.—for all types of commercial heating with oil, gas or combination oil/gas. Write: Dept. P, 315 E. Keefe Ave., Milwaukee 12, Wis.



Cleaver Brooks®
Progress
Packaged Heating Boiler

NEW CATALOGS

(Continued from page 124)

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

VENTILATION FANS—A 4-page illustrated bulletin (No. 8914) describing the company's expanded line of Model IC Ventura fans is available from American-Standard, American Blower Division, Detroit, Mich. Tables list 42 low-pressure fans and 50 high-pressure fans, giving fan speed, motor horsepower, dimensional data, quietness rating and net weight, as well as delivery over a range of static pressure values.

Circle **Item 65** on Inquiry Card

STAINLESS STEEL FITTINGS—An 86-page reference volume on stainless steel pipe fittings, announced by Ladish Co., Cudahy, Wis., gives detailed information on a broad line of both IPS and tube-OD welding fittings, screwed and socket welding fittings, and ASA, MSS and corrosion weight flanges. Technical section includes manufacturing standards, specifications, data on welding of stainless steel and corrosion resistance tables.

Circle **Item 66** on Inquiry Card

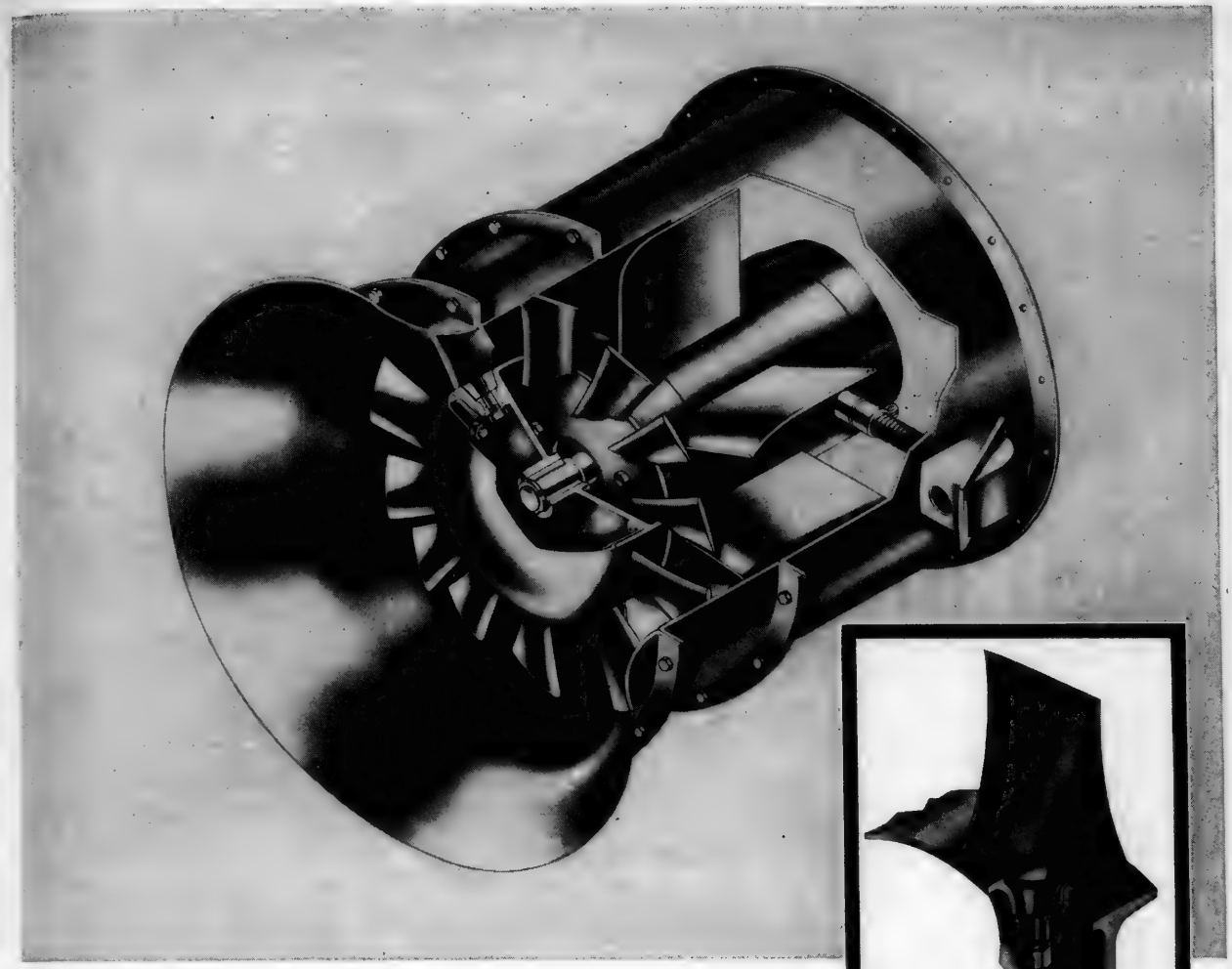
PIPELINE AFTERCOOLERS—Eight-page Bulletin 302.6K1, published by American-Standard, Ross Heat Exchanger Division, Buffalo, N. Y., presents the company's A-100 line of pipeline after-coolers for cooling and drying compressed air. Specifications give details on 54 models, with capacities designated for operating pressures up to 125 psig for single and two-stage compression.

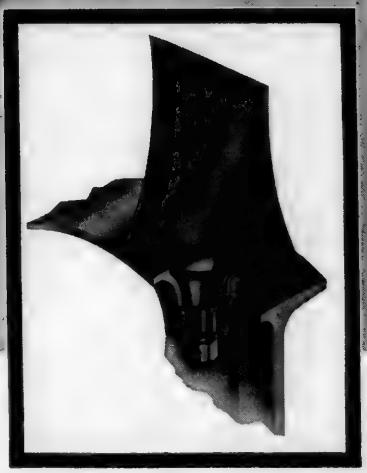
Circle **Item 67** on Inquiry Card

FORCED-DRAFT BURNERS — Bulletin No. 5843, available from Iron Fireman Mfg. Co., Cleveland, Ohio, describes industrial packaged forced-draft firing systems. They are designed for dual-fuel or single-fuel firing of high or low pressure natural, LP or manufactured gas, or any grade of oil from No. 2 through No. 6, in scotch marine, steel firebox, water tube, or cast iron boilers. Included in bulletin are illustrations and information on nine installations.

Circle **Item 68** on Inquiry Card

(Continued on page 128)





YOU CAN CHANGE BLADE PITCH TO CHANGE VOLUME AND PRESSURE WITH

JOY AXIVANE FANS

If calculated and operational requirements differ . . . if system characteristics change . . . or if resistance is difficult to predict —Joy fans can solve your problem. The blade pitch is adjustable. The factory blade-setting can be changed quickly to provide either a wide pressure-range for any particular volume or a change in volume. The inset photograph shows how this can be done using only a common wrench.

Other advantages: The motor is inside the fan . . . no drive losses. This makes the fan unusually compact and efficient . . . easy to mount. There are *1600 standard models* in all combinations of horsepower, pressures, and volumes. Also available with V-belt drives. Send in the coupon now for complete information.

Joy Manufacturing Company, Oliver Building, Pittsburgh, Pa. In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario.

WSW 17317-257

JOY SAVES YOU MONEY ON AIR

Joy Manufacturing Company
Axivane Fan Engineering, Dept. 40
Oliver Building, Pittsburgh 22, Pa.

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name and title

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company

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street address city zone state

I am interested in Joy Axivane Fan information on:

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for DUST

CONTROL

install

FLEXAUST HOSE

Made of strong neoprene coated cotton or nylon fabrics spiral wire reinforced.
For *all* kinds of dust collecting uses, particularly good for elbows and moving hoods.
Exceptionally easy to cut, install, connect, reuse, and relocate.
Sizes 1¼" thru 36" i.d.

Write for details today
Distributors
in all principal cities

THE FLEXAUST COMPANY
Dept. HV-12
ARK AVE NEW YORK N Y

NEW CATALOGS

(Continued from page 126)

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

MULTIZONE AIR UNITS — A catalog, entitled Multizone Air Distributing Units, is offered by Sturtevant Div., Westinghouse Electric Corp., Boston, Mass. Booklet describes the company's complete line of blowers for multizone central air conditioning systems. Comprehensive performance and application data are given. Construction details, dimensions, and typical specifications are also included.

Circle **Item 69** on Inquiry Card

STEEL SHEETS AND STRIP — Called a buyer's guide to every kind of sheet and strip, revised Bulletin 20-1, from Joseph T. Ryerson & Son, Inc., Chicago, Ill., lists types available for prompt shipment in the form of coils, stock sizes, and cut-to-order sizes. Cost factors are reviewed as a guide to economical purchasing practices. Bulletin also contains information on pre-painted steel in slit coils and flat sheets.

Circle **Item 70** on Inquiry Card

PIPE INSULATION—A new cellular-type tube and pipe insulation made of expanded Neoprene, and designed for the refrigeration and air conditioning industries, is the subject of illustrated literature available from Presstite-Keystone Engineering Products Co., of St. Louis, Mo. a division of American-Marietta Co.

Circle **Item 71** on Inquiry Card

LOW TEMPERATURE INSULATION — A 12-page booklet, FL-104, devoted to the use of Foamglas insulation in low temperature spaces is published by Pittsburgh Corning Corp., Pittsburgh, Pa. Booklet contains photographs and brief descriptions of several new types of cold storage enclosures made possible by the special physical characteristics of the cellular glass insulation.

Circle **Item 72** on Inquiry Card

ALUMINUM MASONRY ANCHORS — Two aluminum masonry anchors, the Diamond Hammer Drive and the Fur-N-Strip, are described in Bulletin No. 4058 offered by Diamond Expansion Bolt Co., Inc., Garwood, N. J. Interior construction of both masonry anchors is shown, along with installation methods. Specifications give sizes, suggested working loads, weights, packaging, and catalog numbers.

Circle **Item 73** on Inquiry Card

HEATING COILS — American Air Filter Co., Inc., Louisville, Ky., offers a 30-page bulletin describing its complete line of Herman Nelson heating coils. Bulletin No. 890 contains coil selection information as well as descriptive information on the coils themselves, and includes construction specifications, dimensional data, surface charts, and circuiting and piping diagrams.

Circle **Item 74** on Inquiry Card

PHOTOGRAPHY SERVES ENGINEERING —Photoneering, a combination of photography and drawing as an engineering tool, is described in a 4-page brochure available from Technical Reproduction Service, Newark, N. J. The process saves time and money, and makes engineering drawings easy to visualize with a minimum time needed for interpretation.

Circle **Item 75** on Inquiry Card

GENERAL PURPOSE PUMPS — The AquaLine line of horizontal split-case pumps for hot and cold water handling is described in Bulletin No. B-2100, offered by Peerless Pump Div., Food Machinery and Chemical Corp., Indianapolis, Ind. Bulletin gives complete dimensional data, and operating characteristics in both performance curve form and selection chart form.

Circle **Item 76** on Inquiry Card

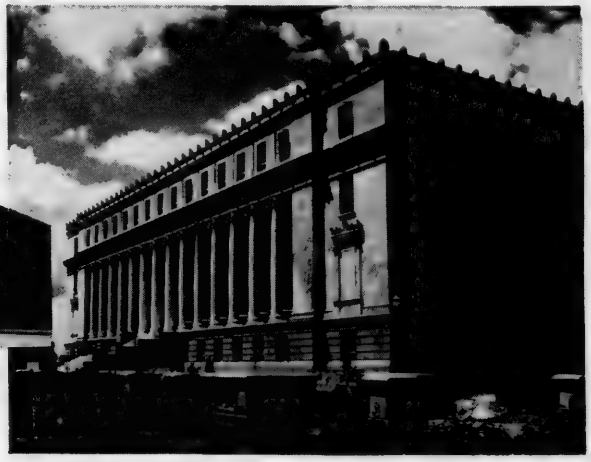
STEAM, HOT WATER GENERATORS— A 6-page color folder, entitled More Performance From Less Investment, is issued by Cyclotherm Div., National-U. S. Radiator Corp., Oswego, N. Y. Folder describes 18 sizes of package steam generators with a range from 15 to 650 hp, and includes specification sheets on 10 sizes of the company's newly developed package hot water generators.

Circle **Item 77** on Inquiry Card

BOILER-BURNER UNITS — Fitzgibbons Boiler Co., Inc., New York, N. Y., announces literature covering 3 new models of forced draft packaged boiler-burner units. Catalog PACK-R-10 describes Model R, in 13 sizes from 59 to 464 hp and equipped with an industrial type forced draft rotary oil-burner. Burners are available for all oils, with or without preheaters; for oil and gas combination; and for full gas firing. Catalog PACK-PB-10 describes Model PB, in 4 sizes from 59 to 93 hp and equipped with a low pressure atomizing burner suitable for oils through No. 5. Catalog PACK-P-10 covers Model P, in 4 sizes from 59 to 93 hp and equipped with a high pressure atomizing burner for light oils up to No. 2, as well as gas or gas/oil combination.

Circle **Item 78** on Inquiry Card

(Continued on page 130)



AT TEXAS A&M

Thermal Engineering year around central plant and multizone air conditioners are in operation in the Administration Building*, the Library*, the Memorial Student Center*, and the U. S. Dept. of Agriculture facility* at the Agricultural and Mechanical College of Texas. Many additional Thermal units are presently to be installed in the new Chemistry Building**.

*Hollis U. Bible, Consulting Engineer, Houston, Texas

**Bernard Johnson & Associates, Consulting Engineers, Houston, Texas

Thermal Engineering manufactures a complete line of central plant and multizone conditioners, sprayed coil units, heating and ventilating units, heating and cooling coils and air-cooled condensers. Write for complete information and a list of satisfied users.

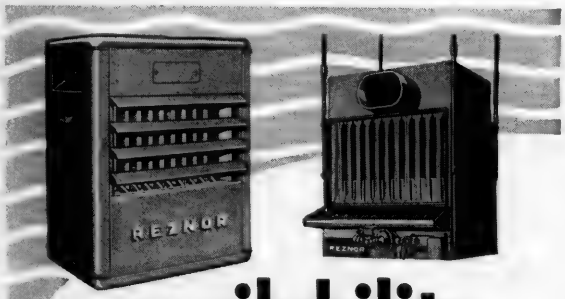
See our exhibit at the 14th International Heating & Air Conditioning Exposition, Convention Hall, Philadelphia, January 26-29, 1959, Booth #16.

Quality Products Since 1945

THERMAL ENGINEERING CORPORATION

2605 W. DALLAS • P. O. BOX 13254

HOUSTON 19, TEXAS



availability

When you specify Reznor gas heaters, you can do so with confidence that the equipment you call for will be available when it's needed, anywhere in the country. Substantial stocks of all the most frequently used models (both unit heaters and duct furnaces) are maintained by Reznor distributors in more than 200 cities. And if the units you call for don't happen to be available from distributor stocks, shipments from the factory can be made to meet any reasonable schedule.

AVAILABILITY is just one of many reasons why Reznor is right for a wide variety of commercial and industrial buildings. Ask your Reznor distributor for details or write for your free copy of "Modern Heating".

Look for Reznor under Heaters-Unit in the Yellow Pages

REZNOR

WORLD'S LARGEST SELLING DIRECT FIRED UNIT HEATERS

Reznor Manufacturing Company, 64 Union Street, Mercer, Pa.

Stick With

CAIN'S *Fastak* DUCT INSULATION ADHESIVE

STRONG BOND IMMEDIATELY

AN ADHESIVE FORMULATED ESPECIALLY FOR BONDING INSULATION TO METAL DUCTS THAT IS ECONOMICAL, YET IT CONTAINS ALL THE QUALITIES DESIRED FOR AN IMMEDIATE, STRONG, AND LASTING BOND.

ELIMINATES

- Clips, Screws, Caps, Wires, Staples, Tape, etc.
- Extra man to help hold insulation in place on wrap around jobs.
- Time lost in waiting for insulation to bond before brake forming.
- Filming over of adhesive and not bonding on large areas where certain types of adhesives are used.
- Stocking several types of adhesives for different jobs.
- Mixing.

QUALITIES

- WATERPROOF.
- EXTENDED COVERAGE—
  Brush application—230 sq. ft. per gal.
  Roller application—270 sq. ft. per gal.
- TEMPERATURE RANGE—
  Blanket.....—30° F to 325° F.
  Board.....—30° F. to 250° F.
- LABOR SAVING SMOOTHNESS OF APPLICATION.
- COLOR—Clear with slight orange tint.

DUCTAK

DUCTAK is designed for those who desire a slightly slower setting time than Fastak. Approximately one hour is required before ducts may be brake formed without danger of breaking bond. Other than this, all the features and qualities mentioned above apply to DUCTAK.

SOLD ONLY THROUGH JOBBERS AND DISTRIBUTORS

Some Territories Open for Manufacturers Agents Calling on Jobbers and Distributors

CAIN MANUFACTURING CO.

1111 North 5th Avenue Phone TA 2-0334 Birmingham, Alabama

AirMpeler
LO-BOY
CENTRIFUGAL
ROOF EXHAUSTERS
Enhance The Beauty Of Building Skylines

Pats. Pend.

Lowest Silhouette Design

FORWARD OR BACKWARD CURVE WHEEL WITHIN . . . . OR OUT OF SCROLL HOUSING

Motor mounting on side of structure support . . . out of line of air stream reduces height of Lo-Boy models nearly 50% of older designs.

LOW WIND RESISTANCE
SIZES 10",-72" 600-47,000
CERTIFIED C.F.M. RATINGS

- **QUALITY**
- **BEAUTY**
- **PROVEN PERFORMANCE**

See Sweet's File 20c/Amm or Write for bulletin AC100-58

AMMERMAN CO., INC.
110 North Second St.
Minneapolis 1, Minnesota
MEMBER OF THE AIR MOVING & CONDITIONING ASSN.

NEW CATALOGS

(Continued from page 128)

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

WALL-HUNG FIXTURE CARRIERS — Available from Josam Manufacturing Co., Michigan City, Ind., is a booklet combining Price List FC-2, covering the company's Unitron carriers and closet fittings, and Manual FD-2, which contains 10 pages of selection charts relating the company's carriers to many makes and types of wall-hung fixtures. Installation diagrams are also included.

Circle **Item 79** on Inquiry Card

AIR CONDITIONING BLOWER UNITS— A 16-page catalog on its expanded line of medium pressure air conditioning units is published by M. Blazer & Son, Passaic, N. J. The catalog covers the company's line of 1, 2, and 3-fan assembly units, ranging from 500 to 50,460 cfm at static pressures up to 3 inches w.g. Construction features and accessories are illustrated; capacities and dimensions of 39 cabinet sizes in horizontal and vertical models are comprehensively covered.

Circle **Item 80** on Inquiry Card

UTILITY PUMPS—Utility pumps which incorporate the helical screw principle are described in an 8-page catalog offered by Continental Pump Co., St. Louis, Mo. Listed are dimensions and performance data for individual pumps, as well as data covering direct-connected, close-coupled, and V-belt motor driven units, and close-coupled gasoline engine driven units.

Circle **Item 81** on Inquiry Card

GAGES AND REGULATORS—A 60-page product catalog, No. 76-R, is offered by Jas. P. Marsh Corp., Skokie, Ill. Equipment described and illustrated includes gages and gage accessories, pressure-actuated water regulators, temperature-actuated regulators for water and low-pressure steam, and solenoid valves.

Circle **Item 82** on Inquiry Card

EVAPORATIVE AIR COOLERS — Available from International Metal Products Co., Phoenix, Ariz., is a 36-page full-color catalog covering its Arctic Circle line of evaporative air coolers. Performance ratings, dimensions, and specifications are listed for residential, commercial, and industrial models. Installation details are included.

Circle **Item 83** on Inquiry Card

(Continued on page 132)

Dwyer
CONTROLS GAGES
AIR VELOCITY METER
No. 400

One Instrument Tells Both Air Velocity and Static Pressure!

- **Reads directly in feet per minute and inches of water.**
- **Check *all* velocities from 400 to 10,000 F.P.M.**
- **All static pressures from 0 to 10" of water.**

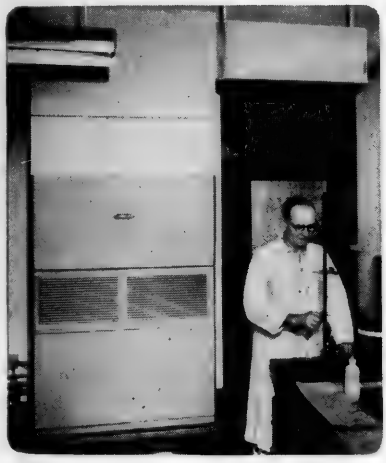
Tests fan and blower discharge and inlet pressures, pressure drop across filters, balances air conditioning systems, etc. Complete kit includes dual purpose manometer, 18" stainless steel pitot tube, Magneclip mounting panel and all necessary fittings, tubings, instructions and accessories.

Write today for literature and prices.

F. W. DWYER MFG. CO.
P.O. Box 373-N Michigan City, Ind.

Air Conditioning & Refrigeration

Serving the Great BARNES HOSPITAL . . . WASHINGTON UNIV. MEDICAL CENTER at St. Louis, Mo.



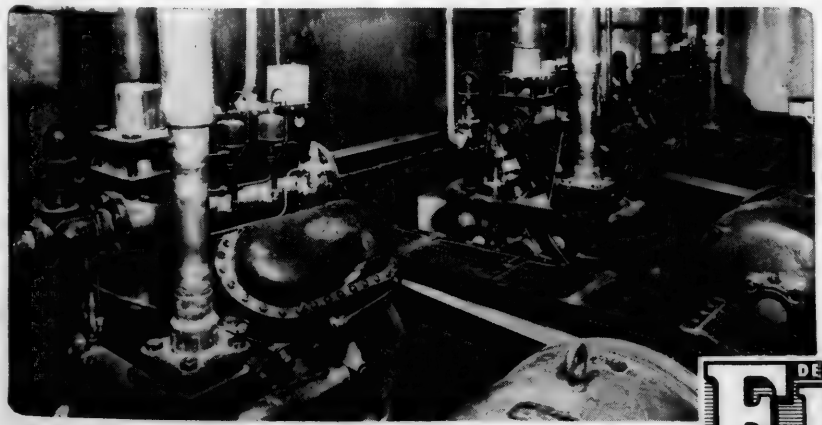
7½-Ton Frick unit air conditioner serving four research and lecture rooms.

Here 11 Frick unit air conditioners and 42 Frick compressors supply the necessary cooling services for operating rooms, private rooms, auditorium and chapel, class rooms, nurse-interns' dormitories, offices, libraries, laboratories, cafeterias, kitchens, special freezers, research departments, morgues, animal rooms, etc. Installation by L. V. Fleiter Co., Inc., Frick Distributors in St. Louis, Missouri.

Whether you need conditioned air, cold water, ice, cold rooms, or very low temperatures,—for human comfort, food service, process work, quick freezing, research, or any other commercial or industrial purpose,—there's a Frick system to meet your exact requirements.

Let us quote now on the equipment you need.

Write . . .
wire . . . phone or visit.



Three Frick "ECLIPSE" compressors which air condition several operating rooms at Barnes Hospital, St. Louis.

DEPENDABLE REFRIGERATION SINCE 1882
FRICK CO.
WAYNESBORO, PENNA., U. S. A.

NEW CATALOGS

(Continued from page 130)

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

FUEL BURNING UNIT—Peabody Engineering Corp., New York, N. Y., offers an 8-page brochure describing its completely redesigned PK-54 automatic fuel burner. Bulletin 430B also illustrates applications of the packaged burning unit, which contains complete combustion control modulating system, flame failure and sequence interlock systems, air handling system, fuel atomizing system, and factory-installed piping, valving, and wiring.

Circle **Item 84** on Inquiry Card

CONTROLS FOR DIESEL ENGINES — Entitled Controls for Diesel Engines, a 24-page bulletin (B45-1) published by Industrial Div., Minneapolis-Honeywell Regulator Co., Philadelphia, Pa., describes temperature and pressure control systems for diesel engines, safety devices, tachometers, control motors, valves, switches, relays, and related accessories.

Circle **Item 85** on Inquiry Card

SHELL AND TUBE CONDENSERS — Described in 16-page Catalog 8044, published by Dunham-Bush, Inc., West Hartford, Conn., are Heat-X "CSTC" cleanable shell and tube condensers. These heavy duty, high capacity condensers are designed to simplify the mechanical cleaning necessary in areas where poor water conditions exist. Construction details, dimensions, selection data, and performance charts are included.

Circle **Item 86** on Inquiry Card

STAINLESS TUBING AND PIPE—Those responsible for the procurement of stainless tubing, pipe and welding fittings are offered a technical data card, TDC-189, published by Tubular Products Div., The Babcock & Wilcox Co., Beaver Falls, Pa. Card describes high temperature properties of B&W Croloy 16-13-3 (TP 316), its chemical composition, size ranges, and short time tensile and rupture properties.

Circle **Item 87** on Inquiry Card

PRESSURE DROP IN STRAINERS — The Mueller Steam Specialty Co., Brooklyn, N. Y., manufacturer of strainers for all services, offers pressure-drop charts for its products. Also available is a catalog which provides information on a complete line of Y- and basket-type strainers.

Circle **Item 88** on Inquiry Card

HIGH PRESSURE REDUCING VALVE—A catalog sheet available from Atlas Valve Co., Newark, N. J., describes the company's Type E, Fig. 198 high pressure reducing valve. Valve is adapted for air, gas or hydraulic operation; catalog sheet includes description, operating and ordering information, parts list and dimensions.

Circle **Item 89** on Inquiry Card

INDUSTRIAL SPACE HEATERS — A handy selector guide for heating rooms or buildings, Bulletin GEA-6361B, from General Electric Co., Schenectady, N. Y., gives four steps for selecting the correct industrial space heater and control. Publication includes chart for determining kilowatt-hour requirements by outside and inside temperature difference and building or room volume in cubic feet. Example uses natural or forced convection space heaters and controls. Complete product data is listed for controls as well as for both types of heaters.

Circle **Item 90** on Inquiry Card

TEMPERATURE INSTRUMENTS—A short form catalog which covers the company's complete line of thermistor based temperature measurement and control instruments is available from Yellow Springs Instrument Co., Inc., Yellow Springs, Ohio. Descriptions of 4 measuring instruments, 2 control instruments, and 22 probe types are included.

Circle **Item 91** on Inquiry Card

ACCOUNTS PAYABLE HANDLING — Royal McBee Corp., Port Chester, N. Y., has issued a brochure (S-535) on its plan for efficient accounts payable handling, using the company's General Records Poster. Brochure describes how all accounts payable records are prepared at one writing, with expense distribution as a by-product.

Circle **Item 92** on Inquiry Card

INDUSTRIAL PIPING EQUIPMENT — Production, space and cost benefits in the continuous distribution of industrial gases by custom-built manifold installations are described in a 28-page brochure, Industrial Piping Equipment, available from National Cylinder Gas Division of Chemetron Corp., Chicago, Ill.

Circle **Item 93** on Inquiry Card

HEATERS AND CONVERTERS — Just published by The Sims Co. of Erie, Pa., an 8-page bulletin, No. J-1, includes data on the company's instantaneous heater, booster and converter units. It includes descriptions, capacities, pressures, ratings, dimensions, weights and list prices.

Circle **Item 94** on Inquiry Card

(Concluded on page 134)

GET TROUBLE-FREE CONDENSING AND GREAT POWER AND LABOR SAVINGS

NIAGARA AEROPASS CONDENSERS give you trouble-free, automatic refrigeration at the least spread between head-pressure and suction pressure. You gain a great power saving. You also get removal of superheat before condensing, condensing at subcooled temperature and a refrigerant fully purged of oil. Out-door air takes up heat of condensation through evaporation of the least amount of water; low temperature condensing means freedom from scaling and loss of capacity. Niagara sectional design offers you lower costs for more compact equipment, easier to keep up. You get always full capacity, "new plant" efficiency and continuous savings such as 95% of condensing water cost that add to your profit. Managers who know their costs buy Niagara Aeropass Condensers.

Write for Bulletin 131

NIAGARA BLOWER COMPANY

Dept. HV-12, 405 Lexington Ave., New York 17, N.Y.

Niagara District Engineers in Principal Cities of U. S. and Canada

ANOTHER **PARACOIL** PRODUCT

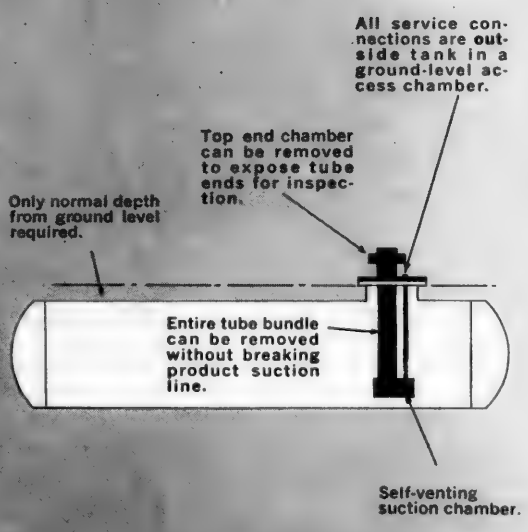
TYPE "VUF"
VERTICAL TANK SUCTION HEATER

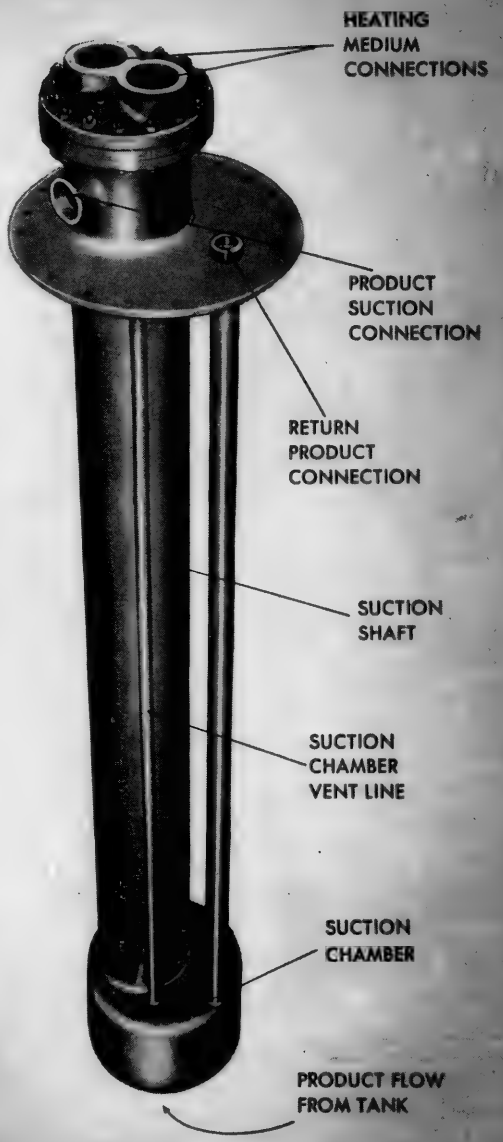
for underground storage tanks

Designed to simplify both installation and service. Heater is suspended from tank manhole flange. **All connections are outside the tank.**

Uses hot circulated fluids as heating mediums — insuring positive suction temperatures.

The simplest method of preheating fuel oils and other viscous liquids in underground storage tanks.


All service connections are outside tank in a ground-level access chamber.
Top end chamber can be removed to expose tube ends for inspection.
Only normal depth from ground level required.
Entire tube bundle can be removed without breaking product suction line.
Self-venting suction chamber.



Hot return product mixes with fresh product in suction chamber, providing an initial temperature rise even before the heating tubes are reached.

Available in standard sizes and capacities for various product fluids.

Alternate Model (Type VSS) employs high pressure steam as the heating medium.

Write for Bulletin 60-J1

DAVIS ENGINEERING CORPORATION

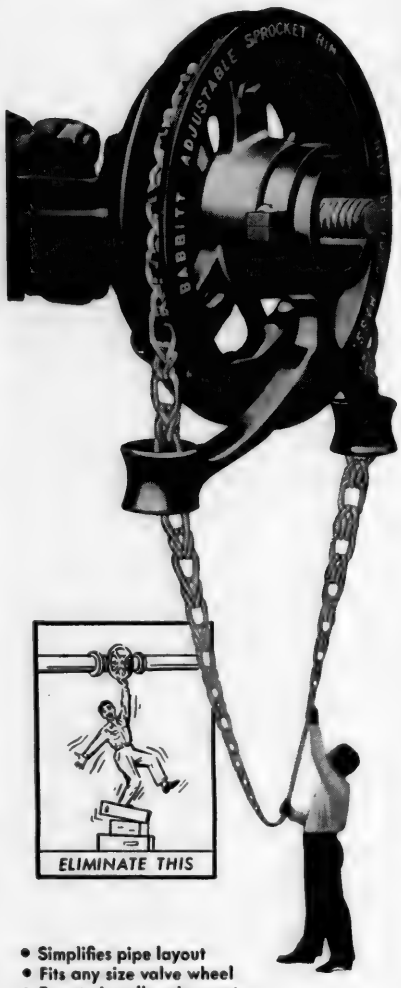
30 Rockefeller Plaza, New York 20, New York • Circle 6-5650

SAFE OPERATION OF OVERHEAD VALVES

with a

Babbitt

Adjustable
SPROCKET RIM
with Chain Guide



- Simplifies pipe layout
- Fits any size valve wheel
- Easy to install and operate
- Operates any valve from plant floor
- Time and money saving fixture
- No maintenance; first cost only cost
- Packed, completely assembled, one to a carton
- Hot galvanized, rust-proof chain available for all sizes
- Easy to follow instructions with each unit
- Your supplier carries complete stocks
- Write for new descriptive catalog sheet and prices

Babbitt STEAM SPECIALTY CO.

5 BABBITT SQUARE, NEW BEDFORD, MASS., U.S.A.

NEW CATALOGS

(Concluded from page 132)

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

SUBMERSIBLE PUMPS—A wider range of 4-inch submersible pumps, featuring new ratings and performances, is described in 4-page Bulletin B255 issued by Sumo Pumps Inc., Stamford, Conn. Included is a selector guide which enables the user to choose the appropriate pump for any depth setting, water pressure, or capacity requirement.

Circle **Item 95** on Inquiry Card

V-BELT DRIVES—A 12-page manual, entitled How to Get Longer Life from V-Belt Drives, is issued by B. F. Goodrich Industrial Products Co., Akron, Ohio. The manual tells how to select and install the belts, how to detect belt trouble, diagnose belt failures, and correct drive troubles. A list of tips for proper V-belt maintenance is included in the manual.

Circle **Item 96** on Inquiry Card

STAINLESS STEEL VALVES — Bulletin No. 7, available from Alloy Steel Products Co., Inc., Linden, N. J., contains information on stainless steel valves for corrosive services. Bulletin provides data on standards, methods of rating, materials of construction, and alloy compositions. It includes design details, illustrates thirty-six basic valves, and describes forty of their variations.

Circle **Item 97** on Inquiry Card

ELECTRIC HEATING EQUIPMENT — A booklet, entitled Electric Comfort for Factories, is announced by Edwin L. Wiegand Co., Pittsburgh, Pa., manufacturers of Chromalox electric heating equipment. Booklet illustrates practically every heating problem apt to be encountered by factory management, and provides an answer for every one through modern electric heating equipment.

Circle **Item 98** on Inquiry Card

REFLECTIVE INSULATION — Complete information on every aspect of home insulation is compiled in the 24-page Alfol Data Book, published by Reflectal Corp., architectural products subsidiary of Borg-Warner Corp. Of particular interest is a thorough analysis of heat transfer problems based upon recent investigations. Books are available at ten cents each upon request to the company at 200 S. Michigan Ave., Chicago 4, Ill.

FAN tas tic

Aeromaster FANS

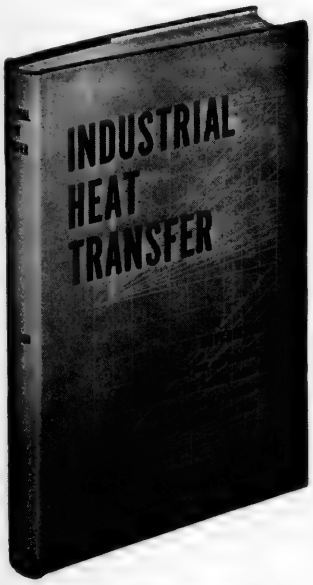
increase cooling tower efficiency with MORE CFM and LESS HP

Precision engineered Aeromaster Fans with variable pitch blades and anti-flutter design give cooling at *lower cost*. Blades resist acids, alkalies, abrasion and weather. 4, 6 or 8 blade styles in 54″ to 22′ diameters. Before you replace or consider new equipment, write: KOPPERS COMPANY, INC., 6912 Scott Street, Baltimore 3, Md.

KOPPERS **Aeromaster Fans**

Engineered Products Sold with *Service*

Time-Saving Working Charts Speed Solution of Heat Transfer Problems



The author, F. W. Hutchinson, is Professor of Mechanical Engineering at the University of California. His knowledge of heat transfer is well-grounded on practical experience as well as theory, as he acts as consultant on heat transfer problems for many industrial firms.

336 Pages

$7.00

By mail order from Canada or overseas, $8.50

A Combined Text and Reference Book for the Practicing Engineer as well as the Student of Heat Transfer

INDUSTRIAL HEAT TRANSFER, by F. W. Hutchinson, provides a selective, time-saving approach to methods of heat transfer analysis. It presents and discusses equations finding the widest industrial application, analyzes their derivation, and then brings the subject to an eminently practical conclusion by providing graphs which permit direct visual solution of the most commonly encountered problems. The 123 working graphs are equal in accuracy to the equations from which they are derived, thereby saving time and reducing the possibility of error in making calculations.

Of particular interest to the industrial engineer is the section covering forced convection of gases and liquids, whether heating or cooling, while flowing within or outside of pipes. Analytical solution for these cases would require the determination of viscosity, specific heat and density—all as functions of temperature. The graphs simplify these cases by permitting direct evaluation of the heat transfer characteristics of each gas or fluid without requiring the determination of any physical properties. Graphs are provided for: air, acetylene, ammonia, benzene, chlorine, ethane, ether, helium, oxygen, pentane, steam, sulfur dioxide, water, and 57 other industrially used liquids and gases.

Five-Day Free Inspection!

If you are a student of heat transfer, or are engaged in practical heat transfer work, order your copy of INDUSTRIAL HEAT TRANSFER today. If you wish, you may take advantage of our Five-Day Free Inspection Plan. See details in coupon below.

---------- **ORDER FORM** ----------

THE INDUSTRIAL PRESS, 93 Worth Street, New York 13, N. Y.

Please send me ..... copies of INDUSTRIAL HEAT TRANSFER at $7.00 each.

Name .....

Company .....

Street and No. .....

City ..... Zone ..... State .....

Home Address .....

(Please fill in if you want book sent to your home.)

City ..... Zone ..... State .....

ACHV 12/58

CHOOSE YOUR MOST CONVENIENT METHOD OF PAYMENT

☐ **I enclose check or money order covering payment in full. (Note price applying to foreign orders.) Send book postpaid.**

☐ **Send book under Five-Day Free Inspection Plan. If I decide to keep book I will send payment, plus postage charges, within five days.**

☐ **Bill me** ☐ **Bill company**

FOR LOW COST HEATING
PLANT POWER-DRAFT AND
INDUSTRIAL EXHAUSTING

Patent No. 2,722,372.
Other Patents Pending.

...Specify

Quickdraft

★ NO MOTORS, FANS OR BEARINGS IN EXHAUST LINE ★ NEEDS NO STACKS ★ ACID RESISTING FINISHES ★ STATIC PRESSURE UP TO 60 INCHES

FOR HEATING PLANTS AND INCINERATORS, Quickdraft provides constant draft for efficient and economical combustion. It eliminates pulsating or chattering, puffing, smoking and sooting. Costly, tall and unsightly stacks are unnecessary.

FOR INDUSTRY, Quickdraft now offers from ¼-inch to 60-inches static pressure for exhausting corrosive gases, abrasives and paint spray . . . moving fine bulk materials and wastes.

FOR MOVING AIR . . . in or out of building through ducts . . . Quickdraft is outstanding.

N-648-QD

IMPORTANT NOTICE

For withstanding corrosive gases, all Quickdraft units are available in standard acid resisting vitreous enamel, No. 316 Stainless Steel, rigid plastics (P.V.C.) and with plastic and Fiberglas coatings.

Write for QUICKDRAFT ENGINEERING DATA on your application . . . today.

Quickdraft CORPORATION P. O. Box 87-O Canton 1, Ohio

BOOK REVIEWS

Publications abstracted in this department should be ordered direct from publisher.

HIGH TEMPERATURE WATER SYSTEMS

An explanation of the principles, design and operation of HTW systems is presented by Owen S. Lieberg, one of America's foremost consultants in this field, in his book, High Temperature Water Systems.

He was responsible for the design of some of the largest HTW systems in the United States, Canada and Great Britain, and he has drawn heavily on his many years of experience in this field. His designs cover military establishments, factories, hospitals and multiple dwelling projects. His book contains much original design data that have been used successfully in actual systems. Tables, graphs, photographs and specifications serve as a working guide.

Particularly stressed are those points which are critical in HTW design: Theory and practice of pressurization; selection of pumps, boilers, and valves; piping, and controls. An entire boiler and auxiliary specification for HTW is included in the Appendix. Two chapters are devoted to space and process heating, with applications of HTW-fed unit heaters, central fan systems, water-to-water heat exchangers, and converters for space heating, domestic hot water, and low pressure process steam. An extensive discussion of specific military and naval installations, drawn largely from the author's work, is given. Typical applications to the plastics industry, hospitals, etc., are outlined.

A feature is a full-chapter treatment of the design of a typical system for a defense project with service buildings. In accordance with principles developed earlier in the book, and a ten-point outline, the HTW system is designed step-by-step. The procedure is readily mastered, after which the engineer should have little difficulty in completing the design of any HTW system.

A wealth of information has been gleaned from Europe, the birthplace of high temperature water, and especially from England, where HTW system design and application are far advanced. Another feature is the detailed economic analysis of a HTW system in comparison to a high pressure steam system. This latter discussion is of particular interest to those who must make the choice between HTW and steam.

High Temperature Water Systems, by O. S. Lieberg. Cloth bound, 6 x 9 inches, 224 pages. Published by The Industrial Press, 93 Worth St., New York 13, N.Y. Price, $6.50.

ENVIRONMENTAL SANITATION

Major phases of environmental sanitation with emphasis on small communities are covered in Environmental Sanitation, by Joseph A. Salvato, Jr., director, Division of Environmental Hygiene, Rensselaer County Health Department, New York.

(Continued on page 138)

AIRPORT SELECTS WEIL-McLAIN BOILERS FOR HEATING AND SNOW MELTING

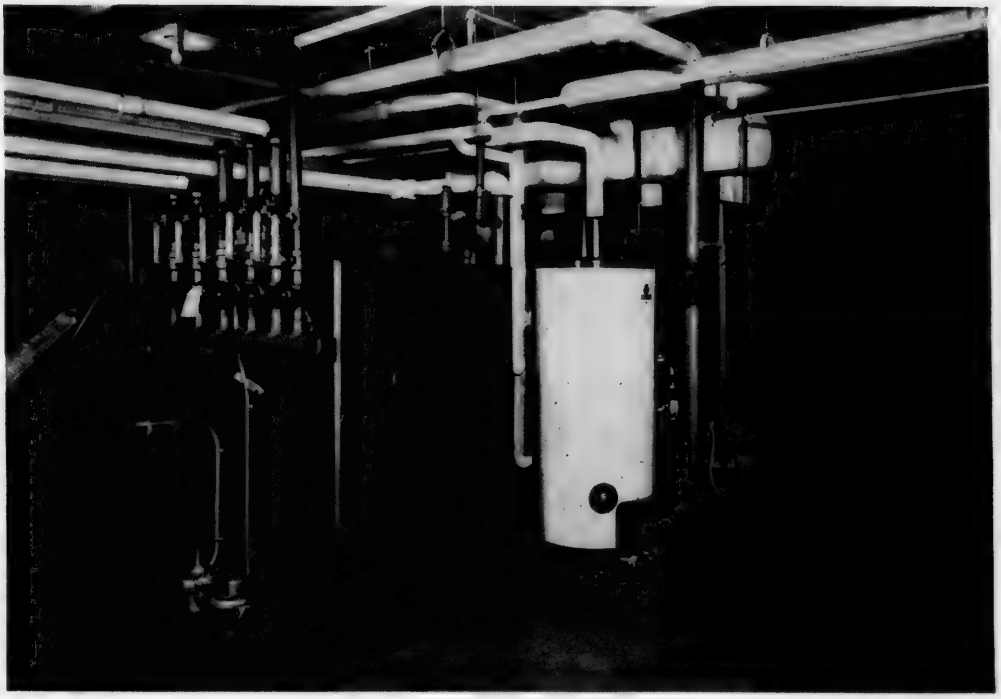
BUILDING:
Port Erie Airport,
Erie, Pa.

ARCHITECTS:
Nelson, Goldberg and
Heidt, Erie, Pa.

ENGINEER:
Don Kennedy

CONTRACTOR:
Wm. T. Spaeder
Engineering Co.

DISTRIBUTOR:
Case-Erie Supply Corp.



Send for engineering data on Weil-McLain Gas and Oil Boilers for Commercial and Industrial Heating Systems. Address Dept. BB-128.

In this unusual installation, Weil-McLain Boilers were the choice to serve two airport needs. The "HR" Boiler at the right is used for space heating and the Type "J" Gas Boiler for the snow melting system. This arrangement, instead of the more conventional method of installing a snow melting system converter on a single boiler, was due to certain restrictions on the use of gas.

In the Erie, Pa., airport area, gas-fired space heating boilers above a certain size must be equipped to use a standby fuel. The Weil-McLain "HR" Boiler therefore has a combination oil and gas burner. In the event of a gas shortage, the "J" boiler handling the snow melting system would not operate, but the function of space heating could be continued by switching the "HR" boiler to oil firing.

This dual purpose installation also made a saving in original equipment cost.

WEIL-McLAIN
BOILERS · RADIATORS

WEIL-McLAIN COMPANY
MICHIGAN CITY, INDIANA

The Kangaroo Who Forgot How To Hop

Once upon a time ...

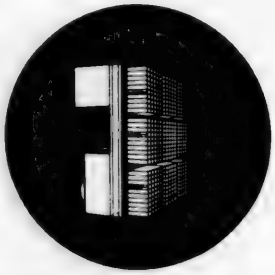
there was an old Roo who decided to rest on his laurels. He had a pouch full of aboriginal air filter designs and wouldn't specify anything new.

His plan boomeranged when he discovered that modern air handling systems required new designs in air filters. He realized he had to get hopping or he'd be left down-under. He tried... but the old bounce just wasn't there.

One day his friendly Far-Air man showed him the new Hi-Kleen, a semi-automatic, disposable media filter which combined two stage filtration in a compact unit. The old Aussie took one look and knew he was back in the game.

Moral:

Compare before you specify. The Hi-Kleen is only one of the new Far-Air Filters that will better meet modern requirements. Slip the coupon below in any mailman's pouch.



FARR COMPANY

NEW YORK LOS ANGELES CHICAGO

FARR COMPANY
P. O. BOX 45187 AIRPORT STATION
LOS ANGELES 45, CALIFORNIA

Boomerang me the new bulletin on Hi-Kleen Filters.

NAME _____

TITLE _____

COMPANY _____

STREET ADDRESS _____

CITY & STATE _____

(Continued from page 136)

A special effort was made by the author to include design, construction, maintenance and operation details as they relate to the small plants and structures. Examples and drawings are used freely for a better understanding of the subject matter.

The text presents the engineering side of a subject that should interest city and county engineers and managers, consulting engineers, and those concerned with public health.

The field is a very broad one, and the content of the book is divided into nine sections which may be described as follows:

1. Control of communicable diseases, insofar as this is possible by understanding and controlling the environment.
2. Location and planning of sites for camp, industrial, housing and similar uses.
3. Water supply sources, design, construction, treatment, storage, distribution and operation.
4. Waste water disposal and treatment, design, construction and operation.
5. Swimming pools and bathing beaches, design, operation and maintenance.
6. Food, sanitary inspection and control.
7. Insect, rodent and noxious weed control.
8. Hygiene of housing, including plumbing and ventilation.
9. Environmental sanitation administration, planning, evaluation and enforcement.

Environmental Sanitation, by J. A. Salvato, Jr. Cloth bound, 6 x 9 inches, 660 pages. Published by John Wiley & Sons, Inc., 440 4th Ave., New York 16, N. Y. Price, $12.

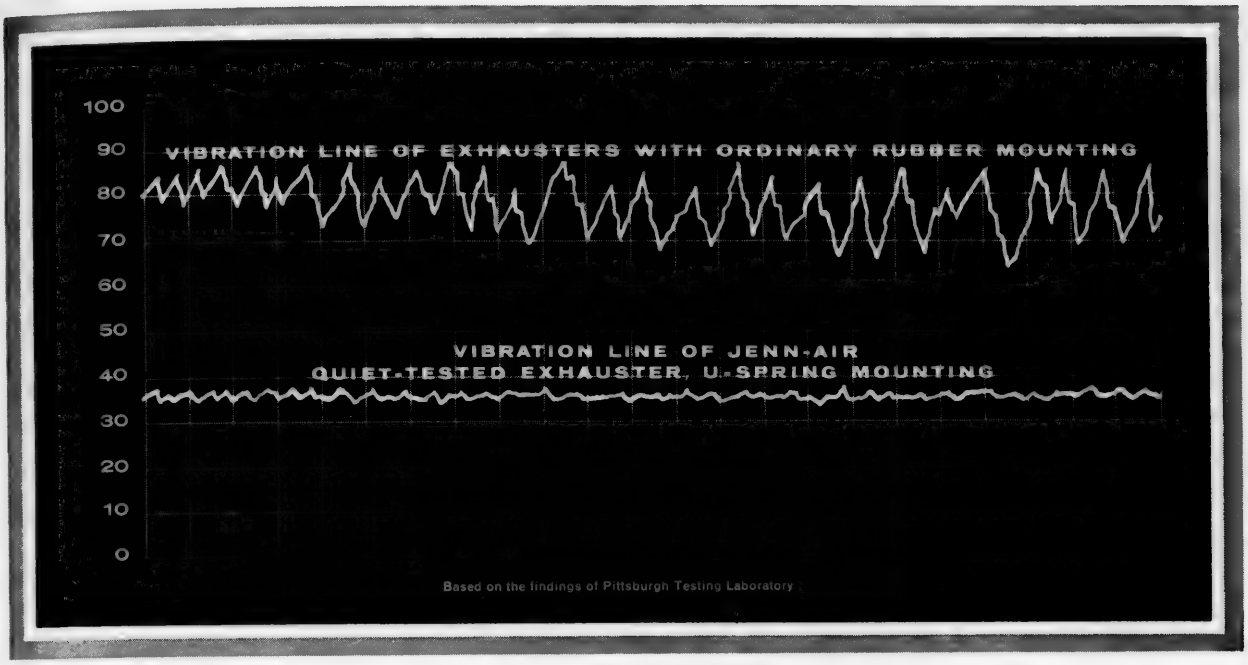
1957 NDHA PROCEEDINGS

Official proceedings of the forty-eighth annual meeting of the National District Heating Association held at The Homestead Hotel, Hot Springs, Va., June 3 to 6, 1957 has just been published. It includes all the papers presented at the meeting, discussions of the papers and committee reports.

1957 Official Proceedings, NDHA. Cloth bound, 6 x 9 inches, 224 pages. Published by the National District Heating Association, 827 N. Euclid Ave., Pittsburgh 6, Pa. Price, $7.50.

• • •

APPRAISAL OF AIR POLLUTION IN TEXAS — At the request of the Texas State Department of Health, a report of factors affecting present and potential air pollution levels in Texas was made by the State and Community Services Section, U. S. Public Health Service. The findings, conclusions and recommendations presented are based on a detailed analysis of existing pertinent date, interviews with local officials and general observations of the investigators. For a copy write to Chief, State and Community Service Section, Community Air Pollution Program, Robert A. Taft Sanitary Engineering Center, Cincinnati 26, Ohio.

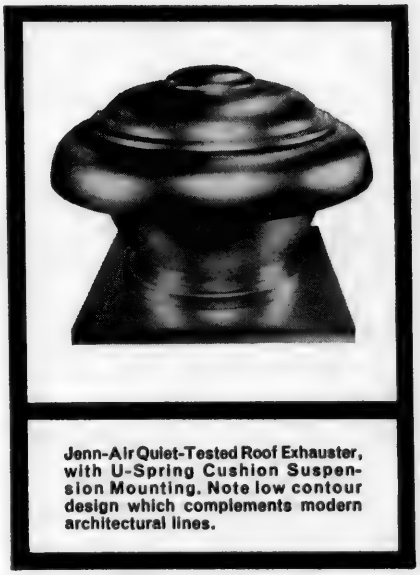


The above chart shows a comparison of vibration levels between ordinary exhausters and Jenn-Air Quiet-Tested Exhausters.

44% Less Vibration with JENN-AIR Quiet-tested Roof Exhausters!

Independent Laboratory Tests Prove Conclusively That Jenn-Air Quiet-Tested Roof Exhausters With U-Spring Suspension Show 44% Better Vibration Isolation Than Exhausters With Power Assembly Mounted in Rubber

Noise elimination is a problem which faces the ventilation industry today. To minimize the noise caused by vibration, Jenn-Air developed the Quiet-Tested Roof Exhauster with U-Spring cushion suspension. Now an independent laboratory offers proof positive this new principle of suspending the power assembly with U-Springs does the job. The PITTSBURGH TESTING LABORATORY, an independent research firm, was recently asked to compare Jenn-Air's Quiet-Tested Roof Exhauster, with U-Spring Suspension Mounting, against exhausters with ordinary rubber isolators. Tests were conducted under actual working conditions. Result: (see chart for dramatic evidence): *Jenn-Air Exhausters showed 44% less vibration transmission than the other exhausters.*



Jenn-Air Quiet-Tested Roof Exhauster, with U-Spring Cushion Suspension Mounting. Note low contour design which complements modern architectural lines.

U-SPRING CUSHION SUSPENSION MOUNTING REDUCES VIBRATION . . . NOISE LEVEL

This innovation is another important improvement by Jenn-Air. It ensures against the major operating vibration and noise being transmitted through the duct work and into the building. The stainless steel also assures you the permanency of this quiet operation. Jenn-Air—and only Jenn-Air—Quiet-Tested Exhausters are proved under simulated field conditions. Each unit must pass rigid inspection by the critical *Vibronic Eye* . . . is 'screened' in Jenn-Air's Sound-Elec Test Chamber to detect noise and vibration.

Patents Pending

JENN-AIR PRODUCTS COMPANY, INC.
1102 Stadium Drive • Indianapolis, Indiana

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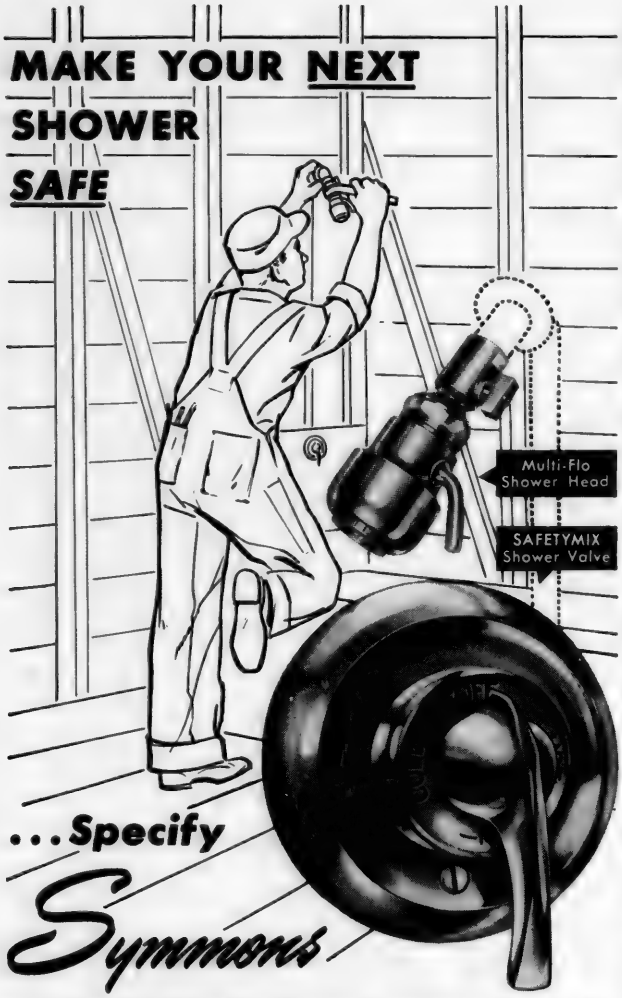
1102 Stadium Drive
Indianapolis 7, Indiana ACHV
Gentlemen:
Please send me free catalog giving complete information on how Jenn-Air U-Spring Cushion Suspension Mounting cuts vibration, lowers noise level.

Name_____
Title_____
Company_____
Address_____
City_____ State_____



For *positive* protection in the shower insist on world famous Symmons SAFETYMIX.
It automatically eliminates the constant danger of scalds or chills.
It costs no more than ordinary shower valves.
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tract to ARI, which will administer the program.

• **MUST RATE IN BTUH OR TONS**—Unitary air-conditioners include central residential units, self-contained air-conditioners such as those used in commercial applications, and other air-conditioning combinations designed as units, as differentiated from room coolers, on the one hand, and large, field-assembled system installations, on the other.

The unitary certification program is based on compliance with all provisions of ARI Standard 210-58, and provides that cooling capacity ratings of unitary equipment be expressed in British thermal units per hour (Btuh) or tons, but not in horsepower of compressor motors, which it is felt is not a true measure of capacity. A ton of cooling capacity is 12,000 Btuh, by definition.

Firms representing the major producing capacity in unitary air-conditioners have entered into contract agreements with ARI, and a number of others are expected to sign in the near future. Under this agreement, manufacturers certify to ARI by submitting data, and certify to the public by display of a certification seal that their products are in compliance with the ARI standard. The seal may be displayed on the equipment as well as on specifications, literature, and advertising.

• **SYSTEM POLICED**—The plan also calls for the "random" testing, by an independent testing laboratory, of a large number of certified units each year, to be acquired from field stock for this purpose. Another phase of the program involves the testing of certified units on which complaints may be received as to unrealistic cooling capacity claims and other allegations of non-conformance with the standard.

If units under test, either in course of the "random" testing procedure or as the result of complaints, do not fulfill requirements, and if these deficiencies are not promptly corrected, privileges of certification may be withdrawn, Mr. Jones stated.

Financing of the program is to be accomplished through the sale of certification seals. A complete list of those companies which have entered into contracts to participate in the program will soon be made public.

NEW INSULATION

said to be twice as effective at high temperatures. Fiber developed for missiles may have mundane uses.

Difficult space-age insulating problems may be solved by a new white fibrous material, which combines light weight with excellent resistance to heat, the Du Pont Company, Wilmington, Del., says.

Called fibrous potassium titanate, the new product is composed of a compact mass of crystalline fibers which due to their fineness give it a talc-like feel. Because of the small diameter (less than 1/25,000 of an inch) and high reflectance of the fibers, the new insulating material blocks heat penetration by scattering incoming infra-red rays.

The product was developed by the Du Pont Company's Pigments Department based on fundamental research on new forms of inorganic materials by the company's Central Research Department. It is now produced on a

semi-works scale at the company's Newport, Del., plant. A decision to manufacture commercial quantities must await evaluation studies now in progress.

• **MAY BE USED ON ROCKETS**—Fibrous potassium titanate appears best suited for insulating applications where space and weight are critical, according to Dr. J. B. Sutton, specialty products sales manager for the company's Pigments Department. In the 1300-2100 deg F range, it is about twice as effective on a volume basis as any known insulating material, he said.

As a thermal insulator at high temperatures, fibrous potassium titanate may offer construction advantages for rockets and missiles, aircraft and atomic-powered vehicles. Suggested but as yet untried uses include insulation for missile nose cones and rocket combustion chambers.

• **EARTHLY APPLICATIONS**— Other suggested applications include use for electrical and acoustical insulation, reflective shielding for heating units and ovens, gaskets and packing, filters, fire blankets and protective clothing, high temperature paints or coatings, high temperature cement and calking, paper filler, as well as plastic reinforcement.

Blocks, which can be formed into any desired shape while wet, show exceptional dimensional stability upon prolonged exposure to heating. After six days aging at 1900 deg, blocks have shown no dimensional change. Fibrous potassium titanate has almost four times the insulating value of commercial firebrick at comparable temperatures with one-twelfth the weight.

One of the unusual advantages of the product is ease of fabrication. Presently available forms include loose fibers, loose fill, blocks of varying densities, mats of various thicknesses, and "lumps." Also available is a trowelable material which, when combined with water, can be spread onto almost any irregular surface like mortar.

WHAT READERS SAY

WET LAY-UP OF BOILERS

EDITOR, AIR CONDITIONING, HEATING AND VENTILATING:

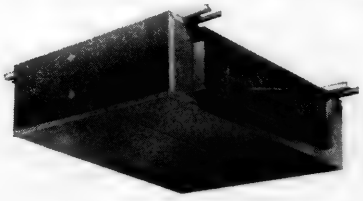
In your October 1958 issue, the Data Sheet on pages 89 and 90 provides recommendations for the care of low pressure heating boilers during lay-up periods. The writer considers most of the suggestions to be sound and in accordance with good engineering practice. However, the suggested "wet lay-up" (page 90), if followed literally, could promote corrosion of the water side of tubes and plates.

Corrosion is likely to occur in a boiler filled with cold raw water and allowed to stand without being fired. Such water nearly always carries dissolved air, which will result in pitting and corrosion.

When a boiler is refilled after draining for any purpose, a charge of water treatment should be added and

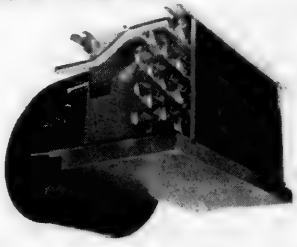
(Concluded on page 142)

ROOM BY ROOM D-H FAN-COIL
"SPOTAIRE"
FILTER UNITS FOR NEW OR
DRAYER
OLD CONSTRUCTION ARE
HANSON
TRULY QUIET BEYOND BELIEF!



LRC's . . . basic unit, concealed or deluxe cabinet (200 thru 600 cfm)

VRC's . . . concealed or deluxe consoles (200 thru 600 cfm)



HRC's . . . three suspended types (300 thru 1750 cfm)

NEED LITERATURE?
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LOS ANGELES 63, CALIFORNIA
CABLE: CLICONI LOS ANGELES

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here's why the THERMOSTAT in Sterlco® TRAPS does more for you...

ALL TRAPS are NOT ALIKE

1. If the thermostat is damaged, the *spring action closes the trap*. Trouble is immediately located because radiation becomes cold — no waste of steam — no searching. Thermostats and seats easily replaced.

2. It compensates for pressure changes — operates satisfactorily even if pressures vary.

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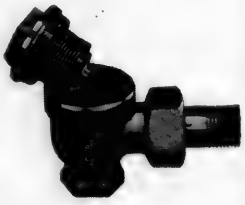
STERLCO THERMOSTATIC RADIATOR TRAPS

Keep radiators clear of condensate without wasting steam. Sturdy bronze bodies and covers—replaceable seats. Angle, Straightway, Corner or Vertical styles.



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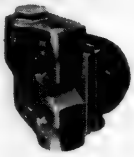
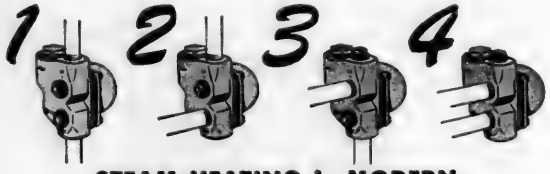
Ideal for installation and rehabilitation of unit heaters. Dependable, compact, large capacity, easy servicing and rugged construction makes Sterlco F & T's outstanding performers on unit heaters and other steam heating equipment.



Install the 3/4" 69B in the most convenient way



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CONDENSATION AND VACUUM PUMPS | HEATING SPECIALTIES | TEMPERATURE CONTROLS

(Concluded from page 141)

the boiler should be brought to a boil, or at least to a temperature of 180F immediately and the boiler vented to eliminate dissolved air. After this initial warm-up and water treatment, the boiler may be laid up wet as described with minimum probability of corrosion during the lay-up period.

You may wish to confirm this claim by writing to Babcock & Wilcox, Tubular Products Division, Alliance, Ohio. For the last four years that company has been conducting a series of accelerated corrosion tests for the Steel Boiler Institute. Part of this test work has been done on boilers under wet lay-up conditions. . . .

Johnstown, Pa. — *John W. Turner*

. . . We concur heartily with the comments made by your reader, with the added comment that the second paragraph under dry lay up recommending moisture absorbents in the ash pit should refer to both dry lay-up and wet lay-up.

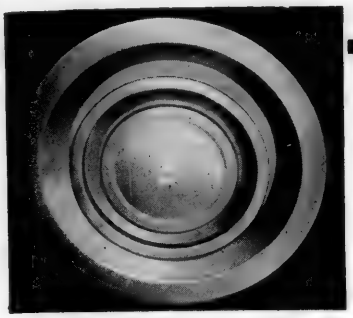
There is no question but that considerable scab type corrosion can take place on boiler tubes when the boiler is filled with cold raw water and allowed to stand all summer. It is generally recommended that after the boiler is brought to a boil and vented to eliminate dissolved air, it should be filled to the top with deaerated water. Deaerated water is usually not available in heating boiler installations, and therefore after the water treatment is added and the boiler brought to the boil it should be laid up as indicated. Your reader's reference to a minimum temperature of 180 deg F should apply only to hot water systems where it may be impractical to produce steam.

H. F. Hinst, Chief Metallurgist
Keystone Street Plant
The Babcock & Wilcox Company
Tubular Products Division
Alliance, Ohio

Canadian Degree-Days for October, 1958*

City	October 1958	October Normal	Cumulative 1958	Cumulative Normal
Calgary, Alta.	628	710	1050	1120
Charlottetown, P. E. I.	610	550	894	790
Crescent Valley, B. C.	670	680	1043	1010
Edmonton, Alta.	676	750	1114	1190
Fort William, Ont.	628	740	965	1110
Grande Prairie, Alta.	751	800	1259	1250
Halifax, N. S.	509	469	704	659
London, Ont.	468	490	642	640
Medicine Hat, Alta.	576	600	874	900
Moncton, N. B.	654	590	960	850
Montreal, P. Q.	540	550	717	740
North Bay, Ont.	657	670	966	990
Ottawa, Ont.	586	580	807	780
Penticton, B. C.	538	520	759	720
Prince George, B. C.	681	750	1193	1210
Quebec City, P. Q.	714	650	1009	940
Regina, Sask.	708	750	1055	1120
St. John, N. B.	643	590	960	950
Saskatoon, Sask.	714	760	1096	1140
Timmins, Ont.	769	780	1151	1190
Toronto, Ont.	432	465	562	619
Vancouver, B. C.	448	440	650	660
Victoria, B. C.	428	410	681	640
Windsor, Ont.	380	410	509	530
Winnipeg, Man.	634	686	940	997

* These data are supplied through the courtesy of the Meteorological Division, Air Service Branch, Department of Transport, Canada.



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WITH ADJUSTABLE PATTERN

Silentair

SUMS UP YOUR AIR DISTRIBUTION NEEDS!

WHAT'S NEW ABOUT THIS DIFFUSER!

1 All aluminum construction.

2 Internal vanes for segmental air pattern adjustment, which is stable in intermediate angles — ceiling or duct mounted.

3 Choice of air movement control from any one or combination of diffuser quadrants.

4 Choice of conditioned zone temperature and humidity control variations as required . . . independently in any one, or combination of four regions served by a single diffuser.

THESE ARE YOUR BENEFITS!

► 1 No corrosion problem.

► 2 Identical and harmonious outward appearance for fixed (CF), adjustable (CA) or combination supply-return (CR) diffusers.

► 3 In "comfort" applications . . . satisfies the "outdoor" type as well as the "sheltered" individual in choice of air movement.

► 4 Simplifies air balancing for comfort or industrial applications by permitting quick, positive temperature and humidity control by putting air where it's needed.

COMPLETE ENGINEERING DATA AVAILABLE . . . WRITE FOR SILENTAIR BULLETIN C-100

GENERAL AIR PRODUCTS CORP.
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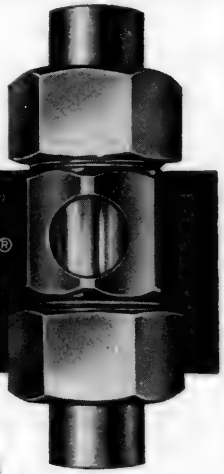

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POSITIVE SEALING INDICATORS
designed to save you even more time and money

DESIGN FEATURE

extension-gasket . . . ALL ONE-PIECE!
A built-in gasket that's always in place for positive sealing and foolproof assembly.

6 sizes now available: ⅜", ½", ⅝", ⅞", 1⅛" and 1⅜" O.D.S.

The "250" has all the proved Liquid Eye advantages *plus* these newly engineered features:

- **smaller—more compact, simplified design.**
- **preformed copper extension eliminates need for separate gaskets—*foolproof* installation.**
- **complete, self-contained, economy unit.**

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***Quietly* and *Dependably* Control the Personalized Air Conditioning in 475 Guest Rooms**

Owned and operated by Tisch Hotels, Inc., the Americana has individually-controlled air conditioning, for heating or cooling, in every guest suite. To assure quiet, dependable, personalized control of room temperatures, the air conditioning contractor (York Sales Corp.) selected Jackes-Evans Solenoid Valves.

For complete satisfaction on *your* jobs also, *specify* J-E Valves. Call your wholesaler or write direct today.

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NOW ON HOW THESE

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YOUR
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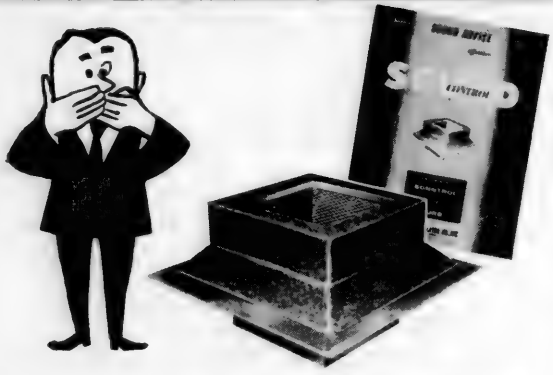
DOMEX ROOF EXHAUSTER*.

Domexes feature "direct discharge" design in addition to the deep one piece spun "Significant Scroll" inlet that provides quiet operation. Full details are contained in the new 12-page Bulletin DMXA-88 available immediately upon request.

**specified recently for Reynolds Metals Co., Massena, N. Y.*

SONOTROL CURB
...FOR SOUND CONTROL



. . . a factory fabricated roof curb combining structural stability and sound attenuating qualities definitely superior to field-constructed curbs. The Sonotrol is priced competitively with on-the-job constructed curbs; it also defines and stabilizes dimensions. It is an excellent companion piece for all motor driven exhausters.

The Penn Ventilator Man in your area has complete details. Contact him for a copy of Bulletin SC-88 containing complete information.

PENN VENTILATOR CO. Inc.
PHILADELPHIA 40, PENNA.
Representatives and Distributors in Principal Cities
Charter Member of AMCA

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available

CONSTRUCTION INDUSTRY CONFERENCE—Fourth National Construction Conference, sponsored by Armour Research Foundation of Illinois Institute of Technology, the American Institute of Architects, American Society of Civil Engineers, Associated General Contractors of America, and the Building Research Institute, at Hotel Sherman, Chicago, Ill. M. J. Jans, conference secretary, Armour Research Foundation, 10 W. 35th St., Chicago 16, Ill. ..... **DECEMBER 10-11, 1958.**

TRI-SECTION MEETING—Combined Metropolitan New York, New Jersey and Philadelphia sections, American Industrial Hygiene Association, John Bartram Hotel, Philadelphia, Pa. Afternoon session and dinner meeting. Secretary, Jesse Lieberman, Department of Public Health, Room 630 City Hall Annex, Philadelphia 7, Pa. ..... **DECEMBER 12, 1958.**

EXPOSITION AND ASHAE CONVENTION—65th annual meeting, American Society of Heating and Air-Conditioning Engineers (Jan. 26-29, 1959) and 14th International Heating and Air Conditioning Exposition, Philadelphia, Pa. A. V. Hutchinson, secretary of the Society, 62 Worth St., New York 13, N. Y. . . . **JANUARY 26-30, 1959.**

HOME PRODUCTS SHOW—Home Improvement Products Show (HIPS), to be held at the Coliseum, New York, N. Y. Ted Black Agency, Medical Arts Bldg., Reading, Pa. . . **FEBRUARY 4-6, 1959.**

INDUSTRIAL VENTILATION CONFERENCE—8th annual conference on Industrial and Mining Ventilation, sponsored by the Division of Occupational Health, Michigan Department of Health; and the Department of Mechanical Engineering and Continuing Education Service of Michigan State University, to be held at Kellogg Center for Continuing Education, Michigan State University, East Lansing, Mich. Write to the University for details. **FEBRUARY 16-19, 1959.**

WESTERN METAL EXPOSITION—Eleventh Western Metal Exposition and Congress, of the American Society for Metals, at the Pan-Pacific Auditorium and Ambassador Hotel, Los Angeles, Calif. R. Y. Bayless, assistant secretary of the Society, 7301 Euclid Ave., Cleveland 3, Ohio. ..... **MARCH 16-20, 1959.**

GAMA MEETING—Annual meeting of the Gas Appliance Manufacturers Association, at the Americana Hotel, Bal Harbour, Fla. H. Leigh Whitelaw, managing director of the Association, 60 E. 42nd St., New York, N. Y. ..... **APRIL 1-3, 1959.**

NUCLEAR CONGRESS—1959 Nuclear Congress, sponsored by the Instrument Society of America and coordinated by Engineers Joint Council, to be held in Cleveland, Ohio. Headquarters to be announced later. Burns & Roe, Inc., 160 West Broadway, New York 13, N. Y. ..... **APRIL 5-10, 1959.**

OHI CONVENTION—37th annual convention of the Oil Heat Institute of America, Inc., at the Olympic Hotel, Seattle, Wash. Secretary, OHI, 500 Fifth Ave., New York 36, N. Y. ..... **APRIL 28-MAY 2, 1959.**

ASRE MEETING—Annual meeting of the American Society of Refrigerating Engineers, at the Lake Placid Club, Lake Placid, N. Y. Secretary of the Society, 234 Fifth Ave., New York 1, N. Y. ..... **JUNE 22-24, 1959.**

ISA INSTRUMENT-AUTOMATION EXHIBIT—14th annual Instrument-Automation Conference and Exhibit of the Instrument Society of America, at the International Amphitheatre, Chicago, Ill. H. S. Kindler, ISA, 313 Sixth Ave., Pittsburgh 22, Pa. ..... **SEPTEMBER 21-25, 1959.**

ASRE CONVENTION—Semi-annual meeting of the American Society of Refrigerating Engineers, at the Hotel Traymore, Atlantic City, N. J. R. C. Cross, secretary of the Society, 234 Fifth Ave., New York 1, N. Y. ..... **OCTOBER 30-NOVEMBER 1, 1959**

ARI EXPOSITION—11th Exposition of the Air-Conditioning and Refrigeration Industry at Convention Hall, Atlantic City, N. J. Geo. S. Jones, Jr., managing director of Air-Conditioning and Refrigeration Institute, 1346 Connecticut Ave., N. W., Washington 6, D. C. ..... **NOVEMBER 2-5, 1959.**

ASHAE MEETING—66th annual meeting of the American Society of Heating and Air-Conditioning Engineers, and the 2nd Southwest Heating and Air-Conditioning Exposition, sponsored by ASHAE, in Dallas, Tex. The meeting will be at the Baker and Adolphus Hotels, and the Exposition in the Memorial Auditorium. Secretary of the Society, 62 Worth St., New York 13, N. Y. . . **FEBRUARY 1-4, 1960.**

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CLASSIFIED ADVERTISING

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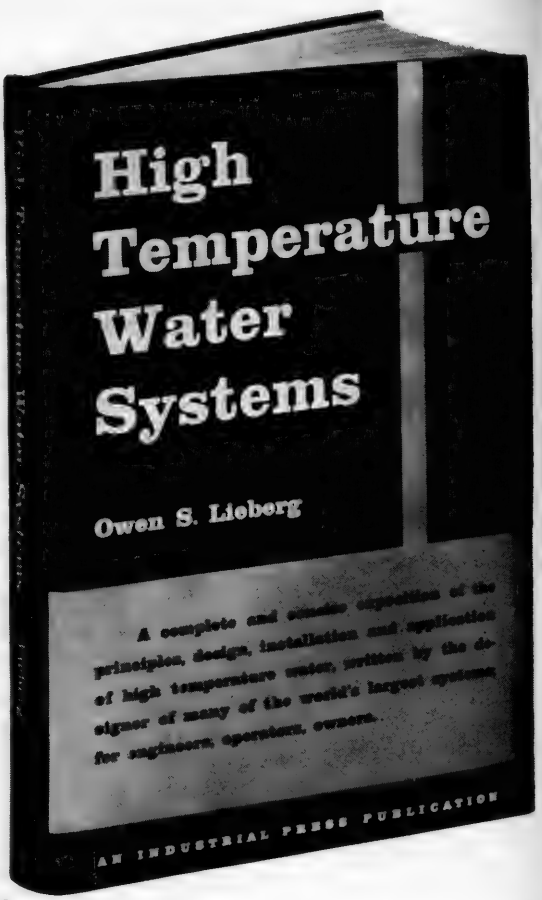
PRINTED FORMS available for immediate shipment. Heating & oil burner materials form, burner service record cards, service order forms, inspection information form, survey sheet and others. Also can supply **BURNER SERVICE** form in 8 part **EZE-SNAP** with 3 carbons in each set, 1200 sets **IMPRINTED** with your name, address and telephone, only $20.40. Send for samples—no obligation. Write Dept. AC, Degree Day Systems, 39-30 58th St., Woodside 77, N.Y.

MANUFACTURERS' AGENTS

An established manufacturer with 25 years experience producing ventilating equipment is looking for manufacturer's agents in many sections of the country to sell their new line of industrial fans. The products include axial flow and tubeaxial fans, both direct and belt driven, and power roof ventilators.

Please reply Box 914, Air Conditioning, Heating & Ventilating, 93 Worth St., New York 13, N. Y.

NEW • COMPLETE AUTHORITATIVE



HIGH TEMPERATURE WATER SYSTEMS meets the need for an authoritative explanation of the principles, design and operation of high temperature water (HTW) systems.

The author is a distinguished international authority who served as consultant on the largest HTW system in England (Bicester Ordnance Depot) and such U.S. installations as the Forbes and Olmstead Air Force Bases and the Cross factory in Detroit. He also designed the HTW system for the largest military establishment in Canada.

The book contains original design data used successfully in actual systems. Tables, graphs, photographs and specifications serve as a working guide . . . and let you benefit from Mr. Lieberg's knowledge and experience.

A special feature is a full-chapter treatment of the design of a typical system . . . step by step . . . based on the principles developed in the book. After mastering this procedure, the engineer will have little difficulty in completing the design of *any* HTW system!

CONTENTS

1. **Advantages of High Temperature Water**
   Arguments for HTW. Brief history. Sample calculation comparing HTW to steam.
2. **Thermal Properties of Water**
   Basic thermodynamics. Units defined. Property tables for water and steam.
3. **Some Design Considerations**
   Temperature drop, system pressure, thermal storage, system flexibility, secondary steam.
4. **Pressurizing the System**
   Reviews pressurizing methods: Steam, air, inert gas. Special cases; heat-power systems.
5. **Boilers and Expansion Tanks**
   Boiler selection. Water tube boilers. Summer load conditions. Sizing expansion tanks. Nitrogen pressure tanks.
6. **Controlling the System**
   Combustion control for various fuels. Control panels. Water level and flow control. Btu meters.
7. **System Circulation Pumps**
   Great detail covering the "heart of the system." Guarding against flashing. Pump specs. Friction heads. Parallel pumps. Auxiliaries, drives, piping.
8. **Valves**
   Valve types and selection. Materials. Emergency closing valves. Valve sizing. Venting by air bottles.
9. **Piping**
   Heat flow capacity of pipes. Design temperature drop. Expansion loops and joints. Pipe sizing and insulation.
10. **Process Heating**
    HTW for process heating. Heat exchangers and converters. Valving and control for process.
11. **Space Heating with HTW**
    Unit heaters. Fan-coil systems. Radiant panels. Complete with application data for all systems.
12. **Applications**
    Describes numerous military and civilian installations in U. S., Canada, and Europe. Economic and design comparison with low temperature water and steam systems for similar situations.
13. **Designing a Typical System**
    Ten-step design procedure for any HTW system. Theory and practice summarized and applied to complete design example.
14. **Appendix**
    A complete specification of a typical boiler plant and auxiliaries for a high temperature water system.

THE INDUSTRIAL PRESS, 93 Worth Street, New York 13, N. Y.

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Fully indexed

ELECTRIC BLAST COIL HEATERS.... for package air conditioners or for duct installation solve both unusual and standard heating problems. Already 22,631 installations. The manufacturer invites you to write for catalogs which discuss a wide variety of problems to see how units sized to specifications can save design and layout work and field time. (Digest inadvertently omitted in November issue.)
Page 125, November 1958 Issue Item 200

CONTROL SPECIALTY LINE..... includes T&P relief valves, pressure regulators, reducing valves, etc.—a specialty to meet practically any protection or control requirement, whether for processing tanks, pipe lines, heat exchangers, air compressors, as well as for heating and plumbing systems. Information available.
Inside Front Cover Item 201

COMPLETE NEW TRAP LINE..... is announced—designed and made especially for low pressure heating service. Advantages are: Low cost, easy installation, internal check valves, years of service life, and minimum maintenance. Bulletin available.
Page 1 Item 202

CONVECTORS ..... are designed by this company for the buildings where low operating costs and high comfort heating are major considerations. Eliminates hot and cold spots. Ends drafts and spreads uniform, clean heat without waste. Bulletin available.
Page 2 Item 203

EXTENDED SURFACE ..... is the only product of this company whose unequalled experience, facilities, and engineering service assure you of high efficiency, long life, and low maintenance and service costs for the heat exchanger you specify. Information available.
Page 5 Item 204

THERMAL CHART OF INSULATIONS.. is handy, one-page chart offered free. Enables selection of insulation required to meet any one or more of 119 different U, C, and R factors at a glance. Assembles for ready reference 82 types and thicknesses of metallic and non-metallic insulations. Thermal values for each are enumerated for heat flow: up, down, lateral; winter, summer.
Page 7 Item 205

ADJUSTABLE COOLING TOWER ..... is a new concept in the field. With adjustable capacity it provides more capacity, infinite selections, is low in cost and is built to quality standards. Literature available.
Page 9 Item 206

VENTILATING EQUIPMENT ..... was surveyed by this manufacturer, and consulting engineers rated quiet operation as most important factor. Manufacturer's equipment shows quiet operation, vibration-free performance. Information is available.
Pages 11-12-13 Item 207

NEW HEATING PUMP..... is a vertical model offering a new high pump efficiency with a minimum motor size. Features close-coupled design and mechanical shaft seal. Complete pump and motor bolted to receiver. Sizes for all installations. Bulletin available.
Page 15 Item 208

EACH BRONZE VALVE..... from this manufacturer is individually pressure-tested for perfect closure before it leaves the factory. Catalog is available.
Page 17 Item 209

WARM AIR SPACE HEATING..... is accomplished by the manufacturer's [illegible] which gives the kind of performance in a heater in which

Below and on the following pages are given brief digests of the advertisements appearing in this month's issue. Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail the prepaid postcard to request further information from manufacturers.

The items appear in the same order as the advertisements to which they refer, to facilitate obtaining further information after reading an advertisement.

NOTE: All advertisements are digested here except those received too late for inclusion. The index of Advertisers lists all the advertisements in this issue.

Use the postcard below for catalogs, new equipment and materials, as well as Ad-Digest items.

every part has been designed and built to function as an integrated unit. Bulletion is available.
Pages 18-19 Item 210

HIGH VELOCITY UNITS..... provide constant volume under all conditions. Exclusive feature assures precision control of air volume and temperature. Information available.
Page 20 Item 211

COPPER, BRASS TUBE AND PIPE..... is second to none in quality because this company has its own facilities from its own refineries to its own depots. Personalized service and efficient delivery, too. Made in U.S.A. to standards of American Industry. Information available.
Page 21 Item 212

NEW FAN LINE..... features flat radial blade wheels for optimum performance in any type of application. One is ideal for sticky, heavy, or abrasive dust problems; another for higher temperatures and another for high efficiency movement of smoke, gas or air. Bulletin is available.
Pages 22-23 Item 213

NO-LOSS STEAM TRAPS..... incorporate design features which assure both effective and economical removal of condensate from steam lines and equipment: low, medium, and high pressure thermostatic traps with renewable thermostats and valve seats; float and thermostatic traps; inverted bucket traps. Bulletin is offered.
Page 25 Item 214

UNDERGROUND SYSTEMS ..... for heat distribution are a specialty of this manufacturer. Hints on specifying are detailed in advertisement. A 24-page catalog with facts and figures for designing and specifying underground heat distribution systems is offered.
Page 26 Item 215

HOT WATER FITTINGS..... produced by this manufacturer have been installed in many buildings from small residences to the largest conceivable but have never failed. They enable one to design a one-pipe forced hot water heating system of any size with assurance that it will be correctly and efficiently circulated. Complete design procedure in handbook offered.
Page 2. Item 216

Circle numbers corresponding to the items and advertisements in which you are interested. Print your name and address clearly. Information will be sent directly from manufacturers.

INQUIRY CARD

Circle below item numbers on which you wish catalogs or further information

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
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PLEASE PRINT Dec. H-58

This service available only to U.S. and Canadian readers.

Name .....

Title or Job Function .....

Firm .....

Nature of Firm's Business .....

Street .....

City .....**Zone** ....**State** .....

This card is void after Mar. 1, 1959

BACKWARD CURVE BLOWERS ..... are completely designed and engineered by the manufacturer. They are thoroughly tested according to test codes of AMCA and NEMA. Catalogs offered.
Page 28 Item 217

CEMENT-LINED HEATERS ..... for hot water storage serve the new Galt Ocean Mile Hotel in Fort Lauderdale, Fla. Quality, delivery, and price were factors in selection. Catalog is offered.
Page 29 Item 218

14th INTERNATIONAL ..... Heating and Air Conditioning Exposition will be held in Convention Hall, Philadelphia, Pa., January 26-29, 1959, under the auspices of ASHAE. Exposition company suggests you write for advance registration.
Page 30 Item 219

REFRIGERANT CONTROLS ..... no matter what the size, guarantee peak performance in any air conditioning installation. Filter-driers, solenoid, valves, expansion valves, distributors, etc. Information available.
Page 31 Item 220

CAPACITOR-START MOTORS ..... for normal starting applications, single phase, 1/6 through 5 hp, give more horsepower with less bulk. Rugged enough to permit direct mounting, compact enough to fit in tight spots. With sleeve or ball bearings; rigid bases or resilient mountings for exceptionally quiet operation. Bulletin gives full details.
Page 32 Item 221

NEW CONDITIONING SYSTEM ..... features flexibility and economy. While saving space, money and maintenance, it provides excellent air diffusion, quietly and with accurate thermostatic control. Seven components illustrated in ad. Information available.
Page 33 Item 222

A WELL PLACED AIR VENT..... worked a heating miracle in a Wilmette, Ill., building. A vacuum system had been a headache for years. Addition of one of the company's vents cleaned up spotty, erratic conditions. Not an unusual story, company states. Catalog offered.
Page 34 Item 223

INDUSTRIAL HEATERS ..... of this manufacturer are thoroughly tested by modern methods of heat transfer and combustion technology. For heating alone, heating-cooling, ventilating, or make-up air requirements. Complete specification and engineering data offered.
Page 35 Item 224

SLOT-TYPE DIFFUSERS ..... manufactured by this company can be seen everywhere. They combine the best features of both slots and efficient air diffusers to provide equalized air flow throughout its entire length. Complete catalog offered.
Page 36 Item 225

COLOR-CODED COPPER WATER TUBE not only saves money and mistakes, but is a guarantee of an American quality product, according to J. H. Spitzley, past president of the Mechanical Contractors Association of America and president of his own contracting company. Mistakes in sizes virtually eliminated. Information available.
Page 37 Item 226

FORCED-DRAFT PACKAGES ..... arrive on the job as a unit, ready to hook up and fire. Complete with burner, prewired control panel, pre-cast refractory chamber and skids. For 15-lb steam or 30-lb water, 216,000-1,800,000 Btuh. Information available.
Page 38 Item 227

HIGH VOLTAGE STARTERS..... for its air conditioning system are selected by G. B. Searle & Co. because this company's unit is the most modern and rugged of its kind. Simple solenoid, air break contractor, with only one moving part, guarantees long life and trouble-free operation. Bulletin offered.
Page 39 Item 228

COOLING TOWERS ..... are designed by this company's engineers to perform like new after years of service. Special pressure creosoting of the wood fill prevents formation of fungus and algae which restrict tower air flow. Permanently lubricated bearings. Corrosion protective housings. Information available.
Page 40 Item 229

PRACTICAL PIPING LAYOUT..... for a hot water supply system, using both submerged coil and separate water heater, shown in advertisement. A free enlargement will be sent on request.
Page 41 Item 230

DRY CONDENSING CATALOG..... describes standard air-cooled condensing systems up to 540 tons and units for heat pump applications with no horsepower limitation. Practically no maintenance.
Page 42 Item 231

REFRIGERANT CONTROLS ..... are offered in a complete line for systems powered by gas or electricity: thermostatic expansion valves, refrigerant distributors, solenoid valves, suction line regulators, flooded evaporator controls and reversing valves. Information available.
Page 43 Item 232

NEW SPLIT-CASE PUMPS..... are quiet operating, low in cost, efficient, and hydraulically balanced. Single stage horizontally split-case centrifugal pumps feature heavy shafts, short span between bearings, minimum space requirements, and top operating efficiency. Bulletins are offered.
Page 44 Item [illegible]

AIR COOLED CONDENSERS ..... of the remote type are offered that require only about one-third of the refrigerant charge used by competitive models. Smaller receivers. A minimum loss if system charge is lost. Exclusive fin construction. Information available.
Page 45 Item 234

TOUGH INDUSTRIAL FAN..... handles any of the three basic processes because it is supplied with three types of wheels to let you handle air, gases, or air or gases containing material or long shavings. Catalog available.
Page 46 Item 235

VALUABLE NEW BOOK..... covers the WHY and HOW of basic Safety Controls for Hot Water Boilers, boilers. A companion to recent booklet, Safety Controls for Hot Water Boilers. Story told in simple diagrams with equally simple explanation. Wastes no words on product descriptions. Yours for the asking, the company states.
Page 47 Item 236

EXPANSION JOINTS ..... give modern, straight line efficiency where loops and bends are the long way 'round. Less heat loss and pressure drop and less valuable space wasted. Cost is 30-50% lower as compared to expansion bends or loops. Information available.
Page 48 Item 237

JOB-SUITED FANS..... are offered for central system applications. Engineers don't have to accept a compromise fan, loosely designed to cover any and all pressure requirements. Bulletions are offered.
Page 49 Item 238

CONSTANT VOLUME REGULATOR.... is new self-operated unit for high velocity systems. Applicable anywhere in a duct system where there are changes in static pressure. No motor operator or other power source required. Information available.
Page 50 Item 239

QUALITY ZINC-COATED STEEL..... will match the specifications of heating or air conditioning duct work as no other metal can. Remarkable strength and rigidity. Booklet available.
Page 51 Item 240

CUSTOM-ENGINEERED MOTORS ..... are designed by this manufacturer's team of more than 100 specialist engineers to produce motors to meet your specific needs. More than 65 years in solving electric motor problems. Information available.
Page 52 Item 241

AIR CONDITIONERS..... from this manufacturer are built for quality. Units are equipped with Ripple Fin coils which create the maximum air turbulence necessary for efficient heat transfer. Information is available.
Page 53 Item 242

FORCED DRAFT BURNERS..... for smaller boilers (oil, gas, or combination gas-oil) eliminates the need for a high stack yet requires no induced fan. For any type boiler from 15-93 bhp. Catalog available.
Page 107 Item 243

CENTRAL CONTROL CENTER..... pictured in ad supervises and controls the air conditioning systems in new Reynolds Metals Building. Installed on aluminum panel in a special control room. One of over 350 such installations, a list of which is available, the whole manufactured, installed, and guaranteed by the manufacturer.
Page 111 Item 244

TWO CONSTANT VOLUME SYSTEMS.. to choose from. (1) For constant-volume control of double-duct systems, uses piston motors with nylon bearings requiring less lubrication. (2) Uses two pressure regulators from each duct for minimum maintenance and constant volume regardless of pressure changes. Information is available.
Pages 112-113 Item [illegible]

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AD-DIGEST SERVICE

AIR CONDITIONED CHURCHES.....
in more and more instances are being controlled by the manufacturer's control system. Recent example is the distinguished modern church shown in ad. Information is available.
Page 115 Item 246

YEAR-ROUND CONDITIONING.....
is provided by what the manufacturer calls the most universal line of air conditioners in the industry. Includes horizontal, ceiling suspended models and vertical models, each in 17 sizes. Information available.
Page 117 Item 247

UNDERGROUND PIPING SYSTEMS...
made by this company found to comply with latest Building Research Advisory Board and National Bureau of Standards findings on what is required of such systems. Certified compliance by independent testing laboratory. Catalog on complete line of systems available.
Page 119 Item 248

COPPER SIMPLIFIES PLUMBING.....
in big addition to Children's Hospital in Pittsburgh, Pa. Some 70,000 lb of this company's copper tube was used in the sanitary drainage system, hot and cold water lines, oxygen, vacuum, and compressed-air lines. Information is available.
Page 121 Item 249

REVERSE VENTILATION.....
may be the answer to your ventilation problems, company suggests. Its low type ventilators supply and exhaust air; blow down fresh air to blanket floor area at ALCOA's Lancaster, Pa. plant. Data book offered; supplies data on complete line.
Page 122 Item 250

EVERY ROOM IS A ZONE.....
and each occupant of residential, institutional or commercial buildings chooses his own temperature, with this company's unique heating system. Simple and efficient. Costs no more than conventional systems. Specifications and full information offered.
Page 123 Item 251

PACKAGE BOILERS.....
of water tube design result in savings because of (1) lower initial cost, actually below many modified Scotch fire tube packaged units, (2) lower operating cost, at 81% efficiency, and (3) lower maintenance cost, with virtually self-cleaning tubes. Bulletin is available.
Page 124 Item 252

ROOF VENTILATION LINE.....
meets all requirements efficiently and economically. Low contour units, high velocity units, wind-driven turbines, and exhaust fans. Catalog available.
Page 125 Item 253

INDUSTRIAL FLOATS.....
are available in copper, stainless steel, Monel, steel, brass, and aluminum. They are built for open or closed tank operation at low or high pressures and temperatures. Catalog is offered.
Page 125 Item 254

COMPLETE LINE ELECTRIC HEATING
includes more than 15,000 standard types, sizes, and ratings from which to select the best heater for the job. Four-page bulletin answers all types of industrial and comfort heating problems.
Page 125 Item 255

BOILER STARTING SERVICE.....
offered by this packaged heating boiler manufacturer assures tip-top boiler performance and greater customer satisfaction. All units fully factory tested, ready to install on job sites; 80% efficiency guaranteed. Information available.
Page 126 Item 256

VARIABLE-PITCH BLADES.....
permit change of volume and pressure characteristics of the vane-axial fans offered. This is of particular value if calculated and operational requirements differ, if system characteristics change, or if resistance is difficult to predict. There are 1600 standard models. Information is offered.
Page 127 Item 257

FLEXIBLE EXHAUST HOSE.....
is recommended for dust control. Made of strong neoprene coated cotton or nylon fabrics, spiral wire reinforced. Particularly good for elbows and moving hoods. Details available.
Item 258

COMPLETE CONDITIONING LINE.....
includes central plant and multi-zone conditioners, sprayed coil units, heating and ventilating units, heating and cooling coils, and air-cooled condensers. Company will supply complete information and a list of satisfied users.
Page 129 Item 259

DUCT INSULATION ADHESIVE.....
is formulated especially for bonding to metal ducts. Though economical, it contains all the qualities desired for an immediate, strong and lasting bond. A slower-setting compound is also available. Information offered.
Page 129 Item 260

GAS UNIT HEATERS.....
can be specified with confidence because this company is prepared to deliver them when they are needed, anywhere in the country. Substantial stocks of both unit heaters and duct furnaces are maintained by distributors in over 200 cities. Booklet offered.
Page 129 Item 261

CENTRIFUGAL ROOF EXHAUSTERS..
of lowest silhouette design enhance the beauty of building skylines. Forward or backward curved wheel within or without scroll housing. Certified cfm ratings. Bulletin is available.
Page 130 Item 262

AIR VELOCITY METER.....
is a single instrument which tells both air velocity and static pressure. Reads directly in feet per minute and inches of water, checks all velocities from 400 to 10,000 fpm, reads static pressures from 0 to 10 inches of water. Literature and prices available.
Page 130 Item 263

CONDITIONING, REFRIGERATION.....
serving Barnes Hospital, Washington University Medical Center, St. Louis, Mo., uses 11 of this company's unit air conditioners, 42 of its compressors. Information on units and systems offered.
Page 131 Item 264

TROUBLE-FREE CONDENSING.....
and great power and labor savings are provided by the design of this manufacturer's condensers. Bulletin is available.
Page 132 Item 265

TANK SUCTION HEATER.....
is designed to simplify both installation and service. Heater is suspended vertically from tank manhole flange. Bulletin is offered.
Page 133 Item 266

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SUBSCRIPTION DEPARTMENT

ADJUSTABLE SPROCKET RIM..... with chain guide provides safe operation of overhead valve wheel, and is easy to install and operate. Catalog sheet and prices available.
Page 134 — Item 267

COOLING TOWER FANS..... increase cooling tower efficiency with more air movement and less horsepower required. Corrosion resistant blades to 23-ft diameters. Information available.
Page 134 — Item 268

FAN ENGINEERING DATA..... are offered in pamphlet published by this company which discusses low cost heating plant power-draft and industrial exhausting.
Page 136 — Item 269

GAS AND OIL BOILERS..... for commercial and industrial heating systems is subject of booklet offered. Unusual installation described in advertisement, this issue, consists of two boilers for Port Erie, Pa., airport. In event of gas shortage, gas-fired boiler for snow melting becomes inoperative, space heating boiler switches to oil standby.
Page 137 — Item 270

MODERN FILTER SYSTEMS..... are necessary for modern air handling systems. This company's semi-automatic, disposable media filter combines two-stage filtration in a compact unit. New bulletin offered.
Page 138 — Item 271

QUIET ROOF EXHAUSTERS..... have been tested by an independent laboratory which showed that this company's line, with U-spring suspension, has 44% better vibration isolation than exhausters with power assemblies mounted in rubber. Catalog is available.
Page 139 — Item 272

SHOWER MIXING VALVE..... provides positive protection. Automatically eliminates the constant danger of scalds or chills. Costs no more than ordinary shower valves. Bulletin available.
Page 140 — Item 273

FAN-COIL-FILTER UNITS..... installed room by room in new or old construction are said by the manufacturer to be quiet beyond belief. Concealed, deluxe cabinet, and concealed or deluxe console, as well as three suspended types are offered. Literature available.
Page 141 — Item 274

SPRING CLOSES STEAM TRAP..... when thermostat is damaged, says this manufacturer. Trouble is located immediately because radiation becomes cold. There is no waste of steam. Units compensate for pressure changes, cannot be damaged by excessive pressures or freezing. Information available.
Page 142 — Item 275

ALL ALUMINUM DIFFUSER..... with adjustable pattern means no corrosion problem; identical and harmonious outward appearance for fixed, adjustable, or combination supply-return diffusers; satisfies individual preferences for air movement; and simplifies air balancing for all applications. Complete engineering data available.
Page 143 — Item 276

POSITIVE SEALING INDICATORS..... proven on thousands of production line installations have one piece extension gasket for positive sealing and fool-proof assembly. Six sizes. Complete line catalog available.
Page 143 — Item 277

QUIET SOLENOID VALVES..... used in 475 guest rooms of fabulous Miami Beach hotel to assure quiet, dependable, personalized control of room temperatures. Information available.
Page 143 — Item 278

EXHAUSTER PLUS SOUND CONTROL are called silent partners to answer your roof ventilation needs. New 12-page bulletin describes roof exhauster line, and another bulletin contains complete information on factory fabricated roof curb.
Page 144 — Item 279

AIR CONDITIONER..... for new Avon Products, Inc. plant, Morton Grove, Ill., is designed for employee comfort and for efficient manufacturing processes. Installed were company's unit ventilating sets, system fans, and air conditioning units, including multi-zone units. Information available.
Inside Back Cover — Item 280

NEW RECEIVER CONTROLLER..... is a pneumatic instrument developed specifically for applications that require remote, centralized control of air conditioning, heating and ventilating systems. Controls valves, dampers, etc., or resets submaster controls. Bulletin available.
Back Cover — Item 281

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Efficient Manufacture Employee Well-being

both aided by Clarage "air" in new Avon cosmetics plant

Here is much more than a thoroughly modern manufacturing facility. Here is a national sales center as well.

It's the new Avon Products, Inc., plant at Morton Grove, Illinois. From it flow the widely popular Avon cosmetic products. To it come members of Avon's door-to-door sales organization for training and sales meetings.

Air conditioning, thus, has a dual role to play in this structure — for employee comfort and for efficient manufacturing processes.

As for so many other noteworthy buildings, Clarage equipment was selected — some of which is shown on the right. On the job are Clarage Ready Unit ventilating sets, system fans, and Multitherm air conditioning units, including the famous Blow-Thru units pioneered and perfected by Clarage for multi-zone service.

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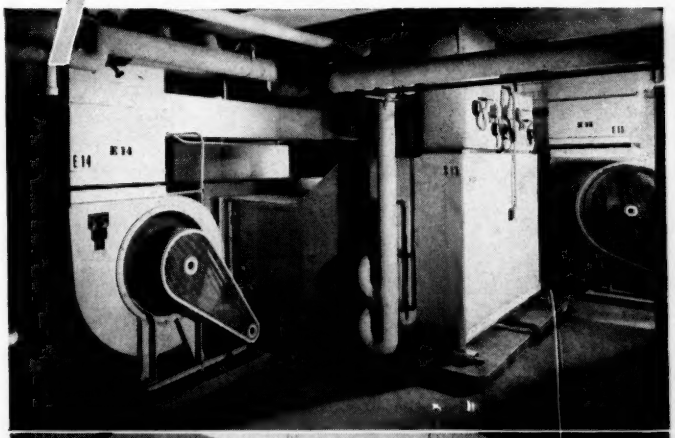

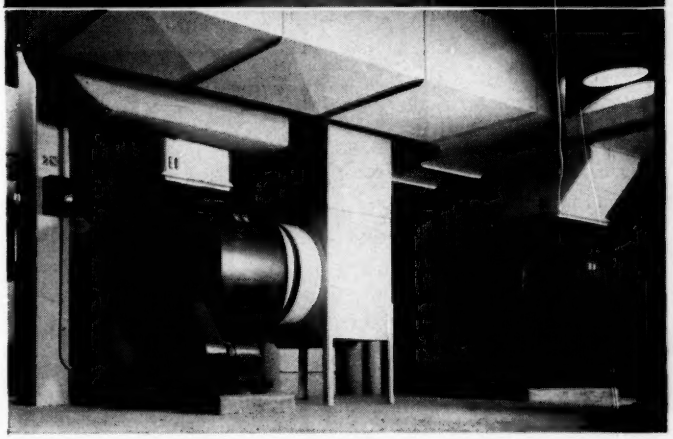

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T-1270 JOHNSON RECEIVER CONTROLLER
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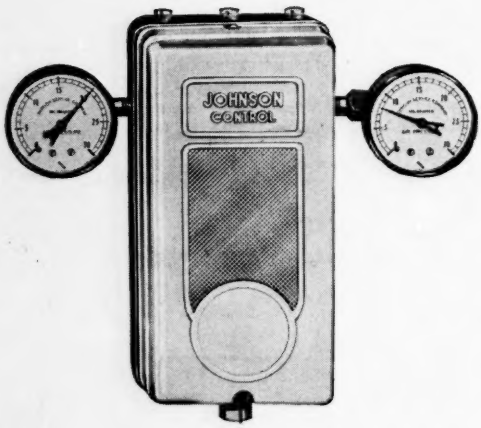

- A new instrument developed specifically for applications that require remote, centralized control of air conditioning, heating and ventilating systems.
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- Flexible metal diaphragm sensing element provides uniform, highly sensitive response over the entire range of operation.
- Pneumatic sensitivity (feedback) assures extreme accuracy of control.
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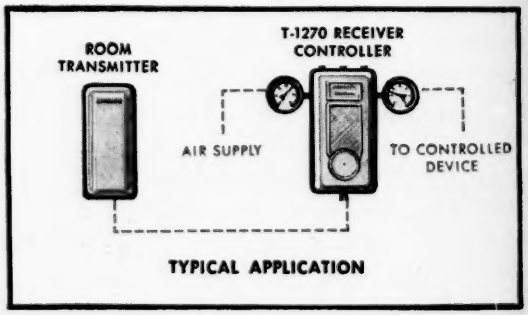

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